APRIL 23, 1956

STEEL
The Metalworking Weekly

A PENTON PUBLICATION

A PROGRAM FOR MANAGEMENT IN 1956 . . No. 3

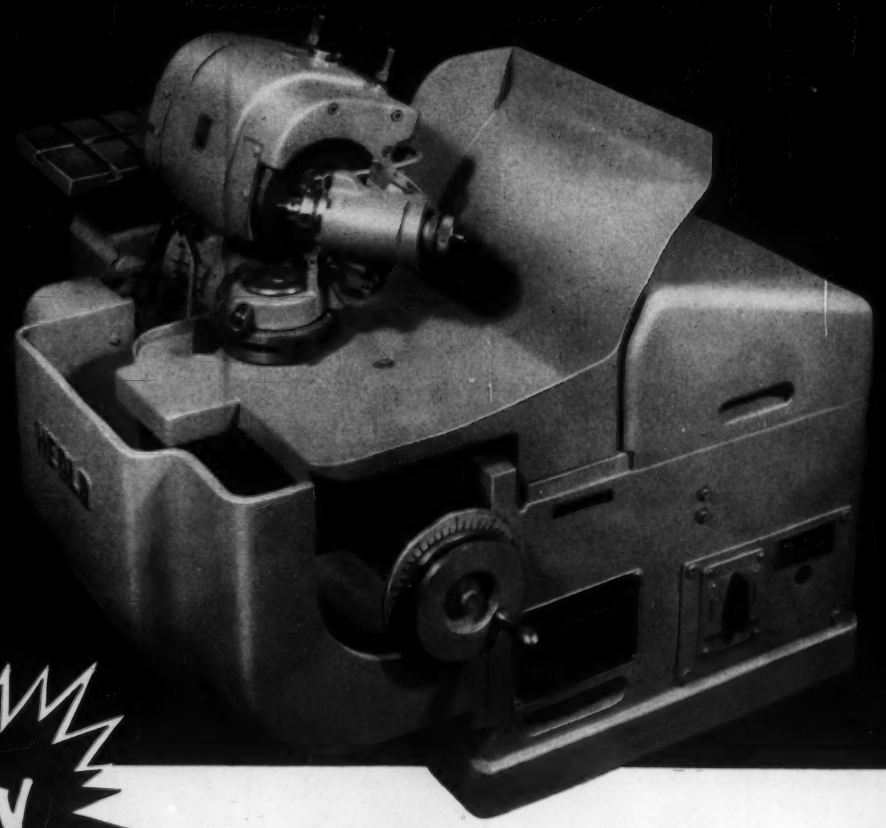
Ideas for Industry

Want a new problem solving technique? Here's one that stimulates creative thinking for your profit. It's called brainstorming . . . page 105

CONTENTS — PAGE 5

sharpen your tools

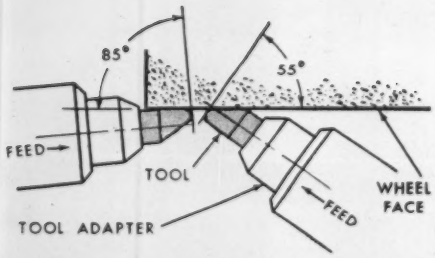
with **MACHINE PRECISION**



new

HEALD MODEL 3 TOOL SHARPENER

saves time, gives longer tool life, permits faster, more efficient borizing



The oscillating tool holder swings through an arc of up to 150°, to grind a maximum side angle of 85° on one side of the tool and 55° on the other side. Front clearance angles are adjustable from −10° to + 30° and tool radius can be set anywhere from 0 to 1¾". Precision calibrated scales eliminate guesswork and the mechanical machine cycle avoids any possibility of human errors or inaccuracies in the grinding operation.

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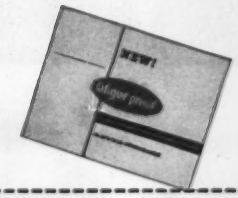

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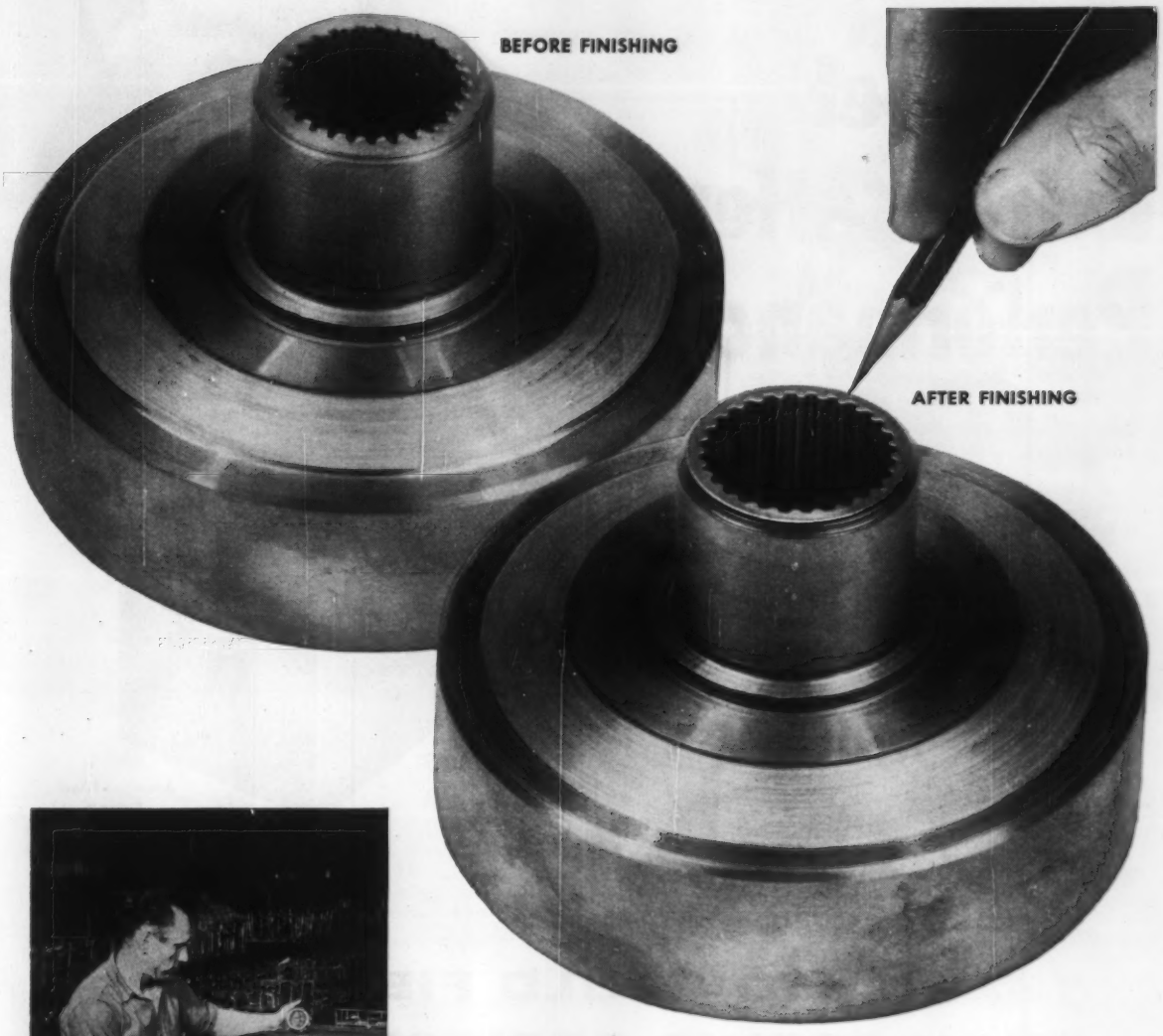

Osborn Brushamatic 3A removes burrs, blends and finishes surface junctures on end of spline in continuous run of 2000-2400 of these gears per day.*

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STEEL
The Metalworking Weekly

APRIL 23, 1956
Vol. 138 No. 17

METALWORKING OUTLOOK, 59

The Editor's Views, 63

Export Business Booms, 65
Competition stiffens, but last year was best since '47

Canada: Big Customer for U. S., 67
The Dominion's needs for American goods will rise still more

Management at Work, 75
E. L. Auker: Pitcher turned salesman

Road Machinery Hits Pay Dirt, 69

Metallizing Takes Hold, 70

Visioneering Inc. Builds Tomorrow's Products, 71

Shipbuilding: Business Looks Better, 77

Windows of Washington, 72
Behind the Scenes, 6
Mirrors of Motordom, 79
Letters to the Editors, 10
The Business Trend, 83
Calendar of Meetings, 25
Men of Industry, 87
Progress in Steelmaking, 124
New Products, 139
New Literature, 159

TECHNICAL OUTLOOK, 115

Honing Tackles a Misconception, 116
Process is proving itself as a metal cutter

More Heat-Treatable Titanium, 118
Ti-140A and Ti-155A join heat-treatable Ti-6Al-4V

Cooling Conveyor Rolls Down Costs, 122
It saves a steel drum fabricator $38,400 yearly

Portable Inspection Tools, 129
A new surface finish indicator and metal monitor

Tips for Better Weldments, 132
A guide to lower fabricating costs

MARKET OUTLOOK, 163

Automation Spurs Mechanical Tubing, 177
"Handy man" of tubular products turns "specialist"

Steel Operations, 163
Nonferrous Prices, 168
Price Comparisons, 164
Steel Prices, begin 170
Nonferrous Roundup, 166
Scrap Prices, 188

Editorial & Business Staffs, 16. Advertising Index, 192. Editorial Index available semiannually. STEEL also is indexed by Engineering Index Inc., 29 W. 39th St., New York 18, N. Y.

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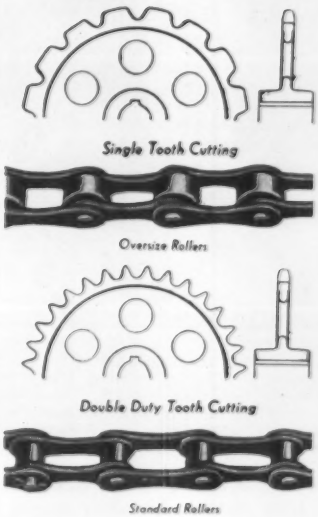
Which Sprocket will live longer



Here is double pitch chain applied on both a single and double duty tooth form sprocket. The single duty sprocket is necessary for use with double pitch chains using oversize rollers. The double duty sprocket used with double pitch chain having standard diameter rollers, has another 'life' by simply moving the chain up one tooth after it is worn in its first position. Double duty cutting in many cases, doubles the life expectancy of a sprocket.

NEW CATALOG

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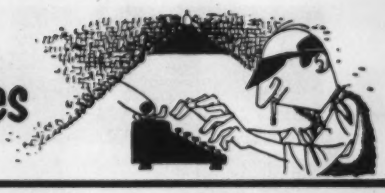

Brainstorming

Some months ago a group of STEEL's editors and artists sat down in an informal slouch about a conference table. Editor Walt Campbell clutched a dinner bell; Building Superintendent Jimmy Waddell hovered over a tape recorder, and Art Director Bill Kellogg absently scrawled diagrams of the stone fireplace he hoped to lay up some day if his back held out.

"This is to be a brainstorming session," Campbell explained, carefully muffling his bell. "We want an idea for a cover, illustrating an article on stimulating creative ideas for industry. . . I don't care how crazy you get. You see, one or two silly ideas might trigger one good one; so let your hair down. There won't be any evaluation or criticism at this time; that will come later, when we hear the playback. If anybody gets out of line, I'll ring this bell. Ready, Jimmy? Ready, cats? Then go, go, go!"

The uninhibited ideas and comments that fizzed from this sober and conservative group would have thrilled graduate psychiatrists, but there is reason to believe they might have shocked a less progressive management out of its gray flannel suit.

"Let's show a close-up of a brain, sort of boiling."

"Maybe a slice of a brain, kind of radioactive."

"What's wrong with a whole tray of brains?"

The eventual cover, descending from brains through firecrackers to atoms, settled into a poster effect, suggesting a chain reaction within a group. The story is on page 105.

Publicity

Our agent in Detroit who signs himself Secret Agent X-9 confesses that he sends in reams of fascinating filler information, but somebody on the ninth floor apparently kills it as fast as it appears. "Did you know," he whispered, "that a GM Diesel locomotive contains more than 70,000 individual parts? That Ford assembly workers mention 'sergeant's stripes,' 'hockey sticks' and 'bananas' when they mean the chrome trim attached diagonally to the rear door or quarter panel, and the grille parts shaped like their nicknames."

Confidentially, X-9, a body has to be careful about the flood of publicity that inundates STEEL's editorial offices. Here is part of a release that came our way, bearing a shocked question mark, acquired somewhere on its way through the editorial rooms: ". . . rate of speed, start, stop, inching and positioning for unloading are controlled by push-buttons from the operator's seat."

If we made the wrong comment on that, we'd be fired.

Graduate Editor

Assistant Editor Ross Whitehead has spent many years studying the mechanics of metalworking. He can skip lightly from broaching, to drilling, to scarfing, to fastening and joining and come back by way of engineering and metallurgy without turning a hair; well, he really can't spare any hairs for turning, but that's neither here nor there. The point we wish to make is that Ross, in spite of his wide and varied experience in metalworking, recently completed an extracurricular course in welding! In testimony whereof, the American Welding Society presented him with a diploma, a certificate which Ross continues to regard with an emotion usually observed in persons staring at dirty old $100 bills.

The Gravy Spot

Larimore Clayton Lightburn's prime alligators retailed at $8.87, and Rudolph, of course, sold 439 of the creatures. J. Robert Wells, the sage of Montana, hastened to dust off another oldie before he retires undefeated. "A circular table," he writes, "is pushed into the southwest corner of a rectangular room. A spot of gravy, overlooked by a sloppy housekeeper, clings to the rim of the table just 5 in. from the west wall, and 10 in. from the south wall. What is the diameter of the table?"

Shrdlu

(Metalworking Outlook—Page 59)

B.F.Goodrich

3000-degrees hot but doors don't melt

A typical example of B. F. Goodrich improvement in rubber

THERE'S melted steel inside those big furnaces. Temperature is 3000 degrees. The heavy steel doors would melt in minutes except for that hose that carries a stream of cooling water in and out of them.

But hose was burning out in months or even weeks. It had to stand heat 24 hours a day, seven days a week, was often banged by big "charging machines," spattered with hot metal. Then B. F. Goodrich developed a new kind of hose made of wire, asbestos and rubber. It had been in use more than a year when the above picture was taken. It is less expensive than the hose used before, is much lighter and more flexible, easier for workmen to handle. One man can install it where two men were needed for other hose.

B. F. Goodrich has made hundreds of improvements in dozens of kinds of hose to make them last longer, cost less, save your time and money. Most improvements, while making the hose stand more abuse, have also made it more flexible and easier to handle. B. F. Goodrich makes hose to carry almost anything—air hose that stands sharp flying rocks outside and hot oil inside, burstproof steam hose that can't burst even if it wears out, hose that lasts for years carrying gasoline, paints, chemicals, even dry materials such as flour or cement.

Call your B. F. Goodrich distributor for more information about any kind of hose, belting or other rubber products. *The B. F. Goodrich Company, Department M-584, Akron 18, Ohio.*

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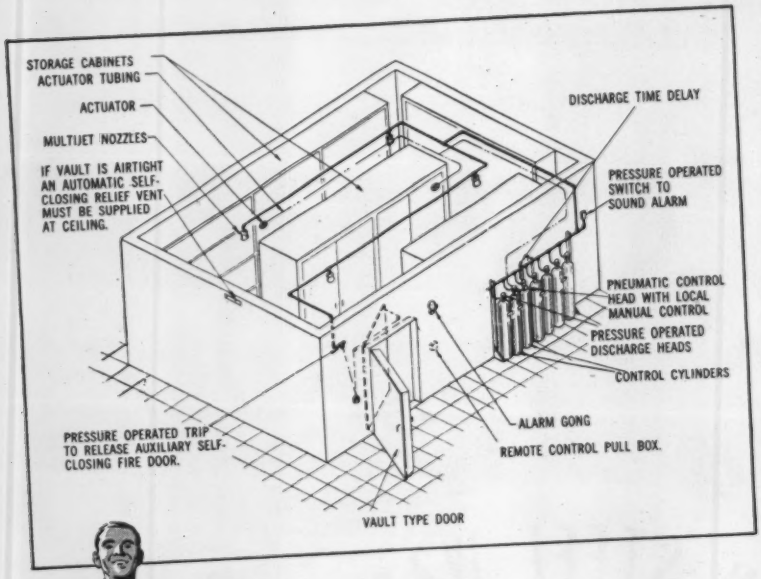
STORAGE CABINETS
ACTUATOR TUBING
ACTUATOR
MULTIJET NOZZLES
IF VAULT IS AIRTIGHT AN AUTOMATIC SELF-CLOSING RELIEF VENT MUST BE SUPPLIED AT CEILING.
DISCHARGE TIME DELAY
PRESSURE OPERATED SWITCH TO SOUND ALARM
PNEUMATIC CONTROL HEAD WITH LOCAL MANUAL CONTROL
PRESSURE OPERATED DISCHARGE HEADS
CONTROL CYLINDERS
ALARM GONG
REMOTE CONTROL PULL BOX.
PRESSURE OPERATED TRIP TO RELEASE AUXILIARY SELF-CLOSING FIRE DOOR.
VAULT TYPE DOOR

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Just let fire destroy one irreplaceable set of records — or original drawings—and your business stands a good chance of bankruptcy! And keep in mind that 44% of the firms whose doors are closed by fire *never* reopen for business again!

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With a Kidde system on the job, fire is out almost as soon as it starts. Kidde rate-of-temperature-rise detectors trigger the system at the first sign of a blaze, guarantee you round-the-clock protection even in case of outside power failure. Using safe, efficient carbon dioxide gas, Kidde systems snuff fire *without* a mess, will *not* damage records, papers or drawings!

Kidde systems have no falling weights, use no clumsy mechanical triggering methods. Pneumatic Control Heads insure instant and complete CO_2 discharge. All moving parts of a Kidde system are self-enclosed for safety, need no replacement after a fire, have easy-to-read indicators which show whether system is "set" or "released."

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LETTERS TO THE EDITORS

Two-Way Use of Story

Please send five copies of the article, "Make Sales Dollars Pay" (Apr. 2, page 56). This is a fine article, and I want to use it both for our own men and for those who call on us.

A. M. Vorys
President
Vorys Bros. Inc.
Columbus, O.

Safe Keeping of Analysis

Please send three copies of the special report, "31st Annual Financial Analysis of the Steel Industry" (insert in the Apr. 2 issue).

This is a valuable statement, and in times like the present, we want to keep it handy for reference.

I am a regular reader of STEEL. Even after being in the steel business for over 50 years, I am still learning many things from STEEL about the business.

M. J. McKay
Special Representative—Steel Sales
Dominion Steel & Coal Corp. Ltd.
Montreal, Canada

I would appreciate receiving four reprints. This feature, in my opinion, has always provided an interesting analysis of the steel industry and has proved to be helpful on many occasions.

D. C. Young
Deere & Co.
Moline, Ill.

Capacity Growth by States

Can you furnish or identify a recent survey of the growth of steel capacity by states? It points out that Michigan doubled its steelmaking capacity in the last ten years from 3,275,420 net tons to 6,760,420. We would like the report for further study.

Miss Jessie I. Bourquin
Economic Research Analyst
Michigan Department of Economic Development
Lansing, Mich.

• *This table can be found on page 2 of the February, 1956, issue of "Steel Facts," issued by the American Iron & Steel Institute, 350 Fifth Ave., New York 1, N. Y.*

Article Carries Punch

I would like to compliment you on your article, "Know Your Costs" (Mar. 19, page 83).

As well as being informative, it approaches the problem in a practical manner and carries a good punch. I

(Please turn to page 12)

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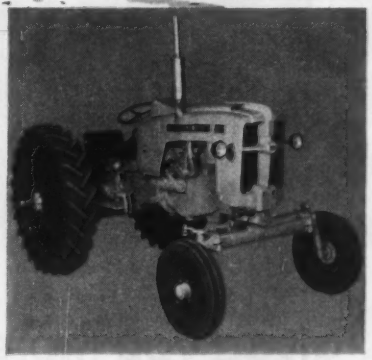

Minneapolis-Moline's new 445 uses a Twin Disc SP-506 ("wet" type-multiple plate) Clutch as a live power take-off. Clutch is within transmission proper and operates in bath of oil.

The *difference* is SPECIALIZATION!

In *agriculture,* old fashioned, outmoded farm implements have been replaced by modern, efficient, *specialized* machines—until today, average value of equipment owned by each farmer is nearly 10 times what it was as late as 15 years ago.

Correctly linking the power source to industrial equipment is also a *specialized* operation. That's why more and more powered equipment manufacturers *standardize* on Twin Disc Friction Clutches, Power Take-Offs, Fluid Couplings and Torque Converters.

Twin Disc has *specialized* in the design, manufacture and application of friction and fluid drives since 1918—when the company was formed for the purpose of manufacturing a farm implement clutch. As use of internal combustion engines spread throughout industry, Twin Disc expanded its operations to serve the power linkage requirements of *all these industries*—until today, it's the world's largest manufacturer of friction and fluid drives for industrial powered equipment. TWIN DISC CLUTCH COMPANY, Racine, Wis., Hydraulic Division, Rockford, Ill.

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LETTERS

(Concluded from page 10)

am pleased to be quoted in an article of this caliber.

Cost reduction and the improvement of cost information are two of the most important and most aggressively pursued projects these days at Canada Iron. We would like to have 20 copies of this article, so we can distribute it (for study and discussion) to our 16 plants and divisions.

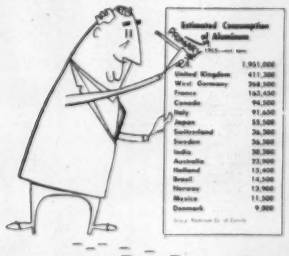
Robert B. Hill
Canada Iron Foundries Ltd.
Montreal, Canada

Answer to Many Problems

Please send two copies of "A Guide to Tool Steels & Carbides" (Mar. 12 insert). From the descriptive information given in your publication, it seems the answer to many of the problems confronting the steel and carbide men in the field.

G. W. Novess
Office Manager
Coromant Sales
Sandvik Steel Inc.
Detroit

Slipping in a Line



The table in the Nonferrous Metals columns of Mar. 19, (page 144) is entitled "Estimated Consumption of Aluminum." The figures represent estimated consumption of primary aluminum.

In the interest of accuracy, I wonder if you could slip in a line pointing out this fact.

H. H. Norsworthy
Aluminium Limited Sales Inc.
New York

Excellent Scrap Summary

I think you did an excellent job in summing up the nonferrous scrap situation in the article, "Scrap Men Probe Problems" (Mar. 26, page 89).

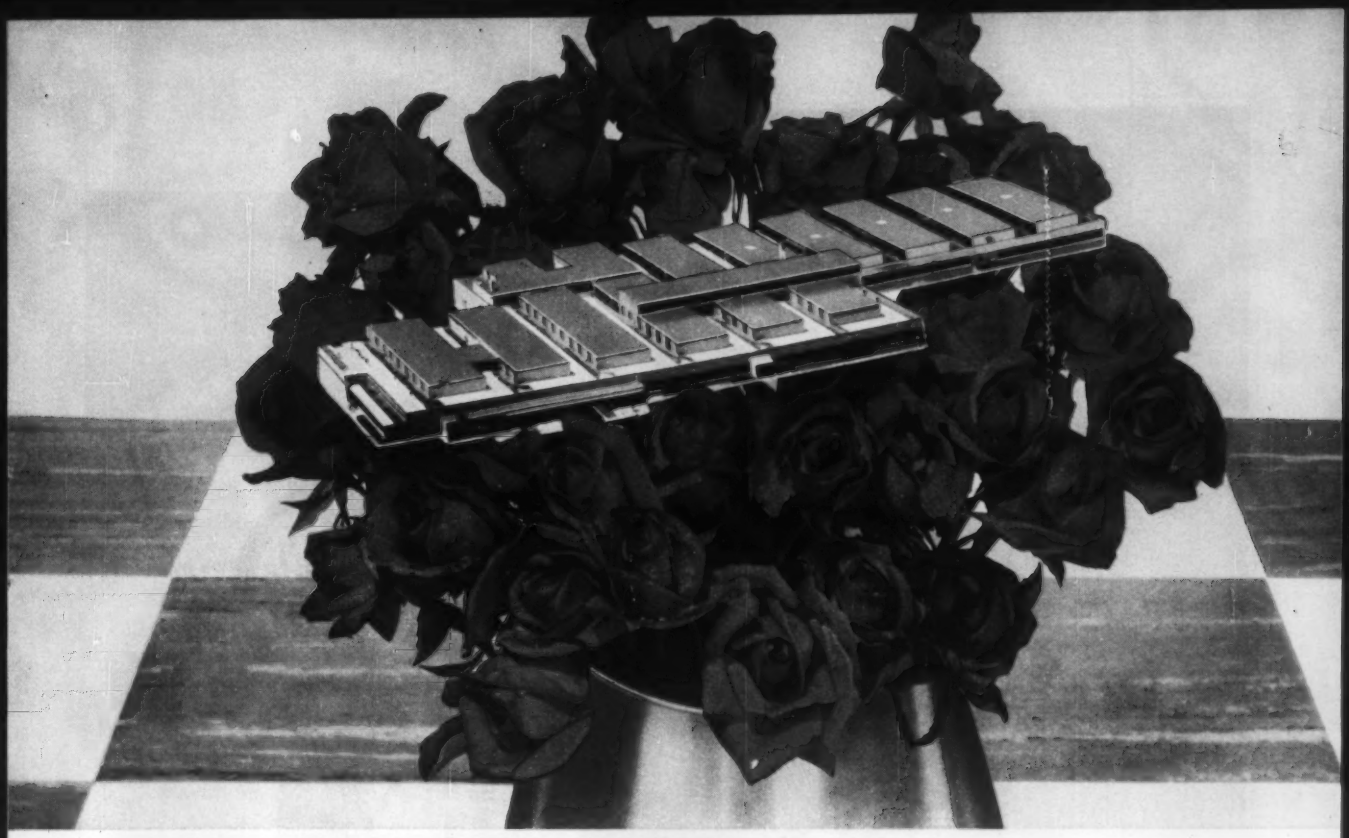
Manny Mighdoll
Director-Public Relations
National Association of Waste Material Dealers
New York

Sinter Ore Story Aids Engineer

Your article, "Sinter Ore—New Glow in Blast Furnace" (Sept. 26, page 112), was of great assistance. We would like to use the photograph on page 112 in a report we are preparing on a new sinter plant for the U. S. Steel Corp.'s Fairless Works. It will appear in our house organ, *The Project Engineer.* May we have your permission to use it?

J. L. Burdock
Project Engineer
Thermix Corp.
Greenwich, Conn.

• *The photograph came from the public relations and advertising department of Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa. We suggest you obtain J&L's permission.*



Want to put your plant on a bed of roses?

You can—easily! Switch to CIMCOOL®, the radically new and different cutting fluid that has become, in just a few years, the largest selling chemical cutting fluid in the world.

Here are just three of many reasons why CIMCOOL Concentrate gets all the bouquets:

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- **CIMCOOL INCREASES TOOL LIFE** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So if you want to see your production picture take on a rosy hue, put CIMCOOL on the job in your plant. Let us give you the full details on CIMCOOL Standard Concentrate—and on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive**—For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

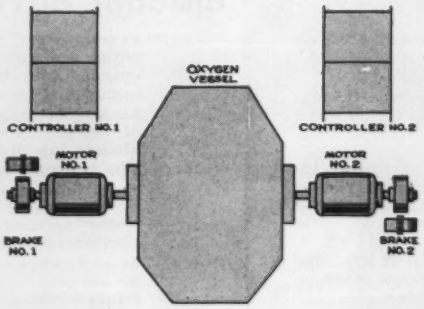
CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

Installation Photos, courtesy of McLouth Steel Corporation.

ANOTHER FIRST BY EC&M...



STEEL IN MINUTES FROM SCRAP AND HOT METAL

Photo "A" shows the scrap car charging scrap into the tilted oxygen vessel. The hoppers on these cars are also used for carrying other additives to the converter. When charging Hot Metal, as in Photo "B", the ladle and the vessel are tilted in unison toward each other for accurate metal transfer.

All operations (tilt and propel) of these cars are EC&M Controlled. Propel motions are also equipped with EC&M Type WB Brakes.

The first Oxygen Converter installation in the United States was built by Pennsylvania Engineering Corp. and is EC&M controlled.

"A"

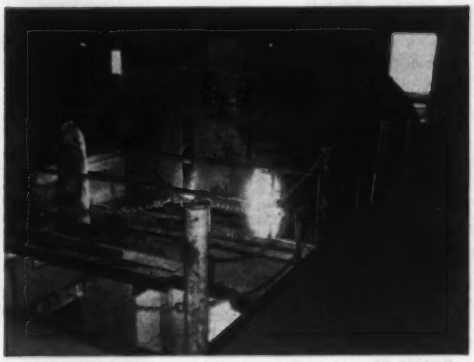
"B"

ELECTRIC MOTOR CONTROL FOR OXYGEN CONVERTERS

For simplicity and maximum safety . . . the scrap car, hot metal car and oxygen vessel tilt, shown here, are equipped with constant potential drives using series wound motors and series brakes.

EC&M Magnetic Controllers provide maximum dependability for all drives and maintain high production under the safest conditions.

We invite you to discuss control for this newest hot metal application at your convenience. Call an EC&M engineer to learn the advantages of this safe, low-cost control for hot metal handling.



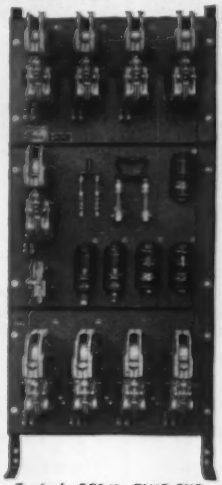
HOT METAL poured from converter vessel into ladle-car below. EC&M Control provides slow speed to avoid spills . . . to permit safe pouring speeds.

CONTROL APPARATUS WITH A REPUTATION FOR SAFE HANDLING OF HOT MOLTEN METAL

- 2 BRAKES
- 2 MOTORS
- 2 CONTROLLERS
- 2 MASTER SWITCHES

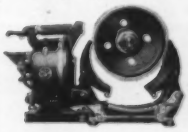
EC&M Bulletin 1190 Cam Master Switches, mechanically connected by quickly detachable coupling.

EC&M Bulletin 1110-2 Rotating Cam Limit Switch for car-ladle tilt.



Typical EC&M TIME-CURRENT Controller for Hot Molten Metal Service. Of the Reversing-Plugging Type, with Armature shunt slow-down on first point.

EC&M Bulletin 1110-1 Type E Limit Switch for car positioning.



EC&M Type WB Brake with 2 separate series windings, one for each motor circuit.

TAB-WELD Plate Resistors Bulletin 942

This EC&M Control System avoids dangerous spills, because each motor circuit is electrically independent, and separate controllers are operated from a double Master Switch with quickly detachable coupling. Should one motor fail . . . no knife, transfer or disconnect switches need be operated to continue operation with one motor.

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DIVISION OF SQUARE D COMPANY

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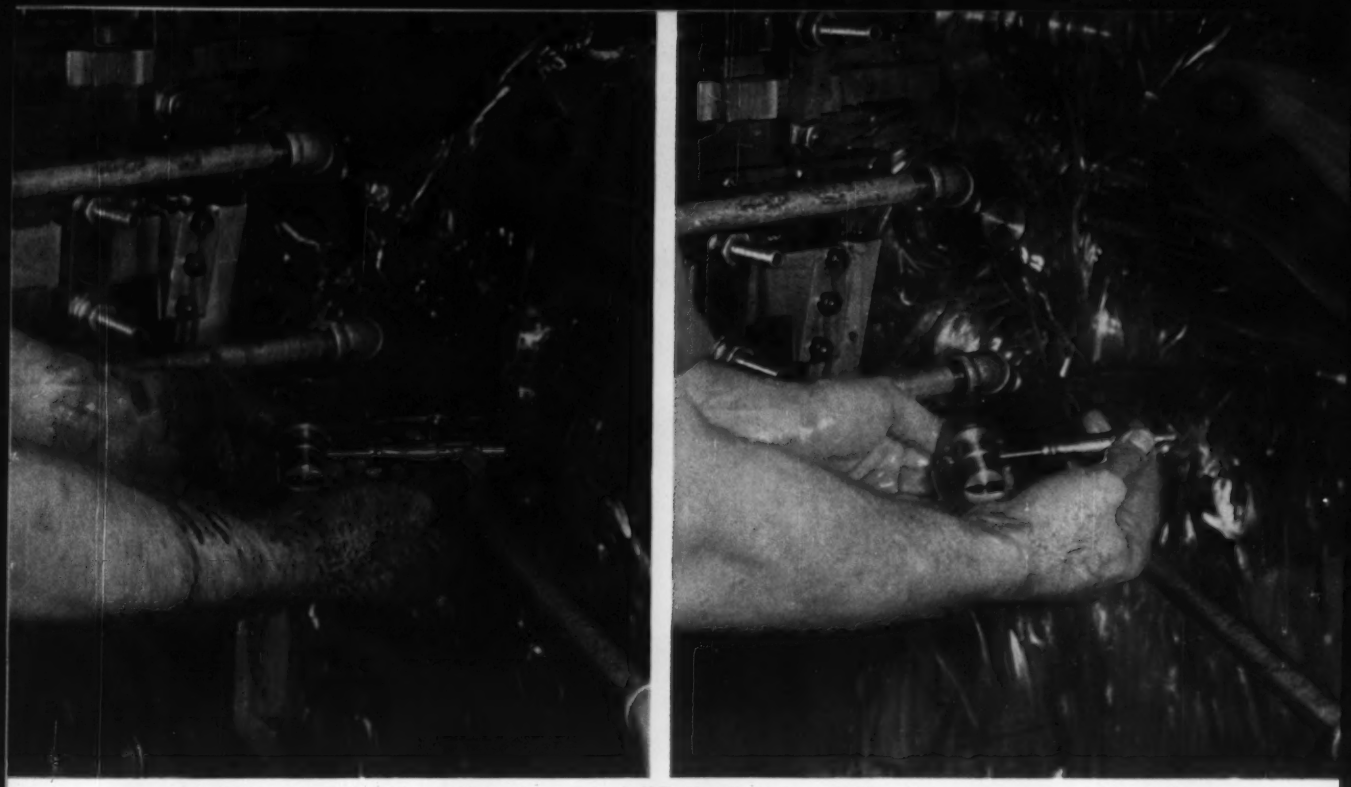

Black cutting oil (left) makes close control difficult. Operators dislike dirty operating conditions it creates. Close control is easier and workers are happier with transparent Sunicut cutting oil (right).

WHY USE A BLACK CUTTING OIL WHEN YOU DON'T NEED IT?

Sunicut oils give you better visibility without sacrificing machining efficiency.

When trying to maintain close control over machines producing precision parts, operators can be handicapped by "black-oil blindness". It is hard to see the tools, the workpiece, and the finishes. Checking close tolerances is difficult when the graduations on micrometers and gauges are obscured.

Worse still, as the operator sees it, are the dirty working conditions caused by dark oils. His clothes get saturated with hard-to-remove stains, and his hands are black from one end of the shift to the other.

Transparent Sunicut oils help keep your operators happy and will make close control easier ...and transparent Sunicut oils will do the job with no sacrifice in machining speed or finishes.

To get the full story on Sunicut oils, see your local Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-41.

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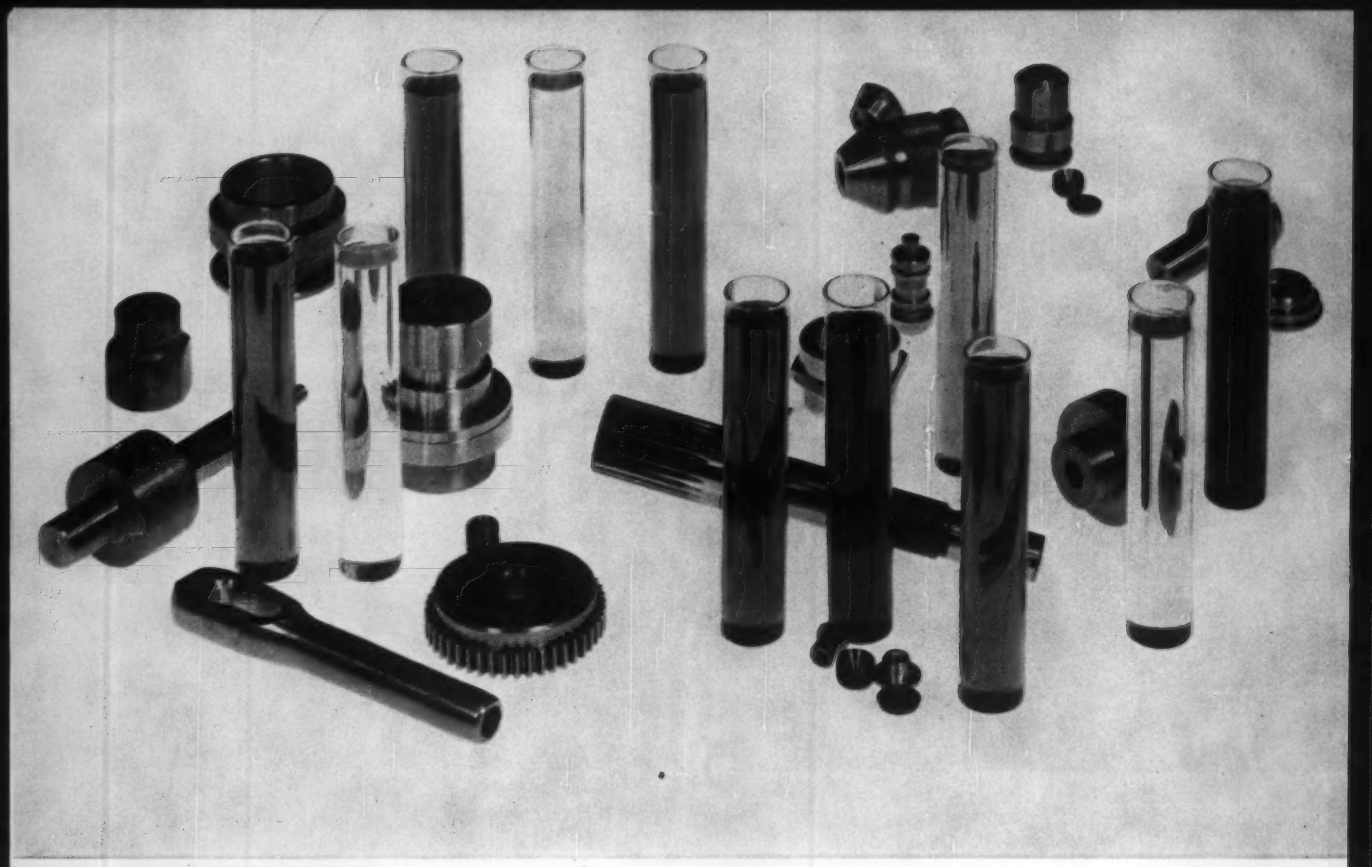

For any machining or grinding operation...

THERE'S A SUN OIL THAT'LL GIVE YOU HIGH EFFICIENCY AND LOW OVER-ALL COST

No two machine shops have exactly the same problems when it comes to selecting cutting oils...even when they're running the same job. And, until somebody comes up with the truly universal cutting oil, you can't afford to disregard the importance of oil selection. Here's how Sun can help you.

First, Sun makes a complete line of emulsifying and straight cutting and grinding oils. Second, your Sun representative, backed up by field engineers, has the necessary practical experience to recommend the oil that will give you both high machining efficiency and low over-all costs.

For the full story about Sun's cutting oils, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-42.

SUNOCO®

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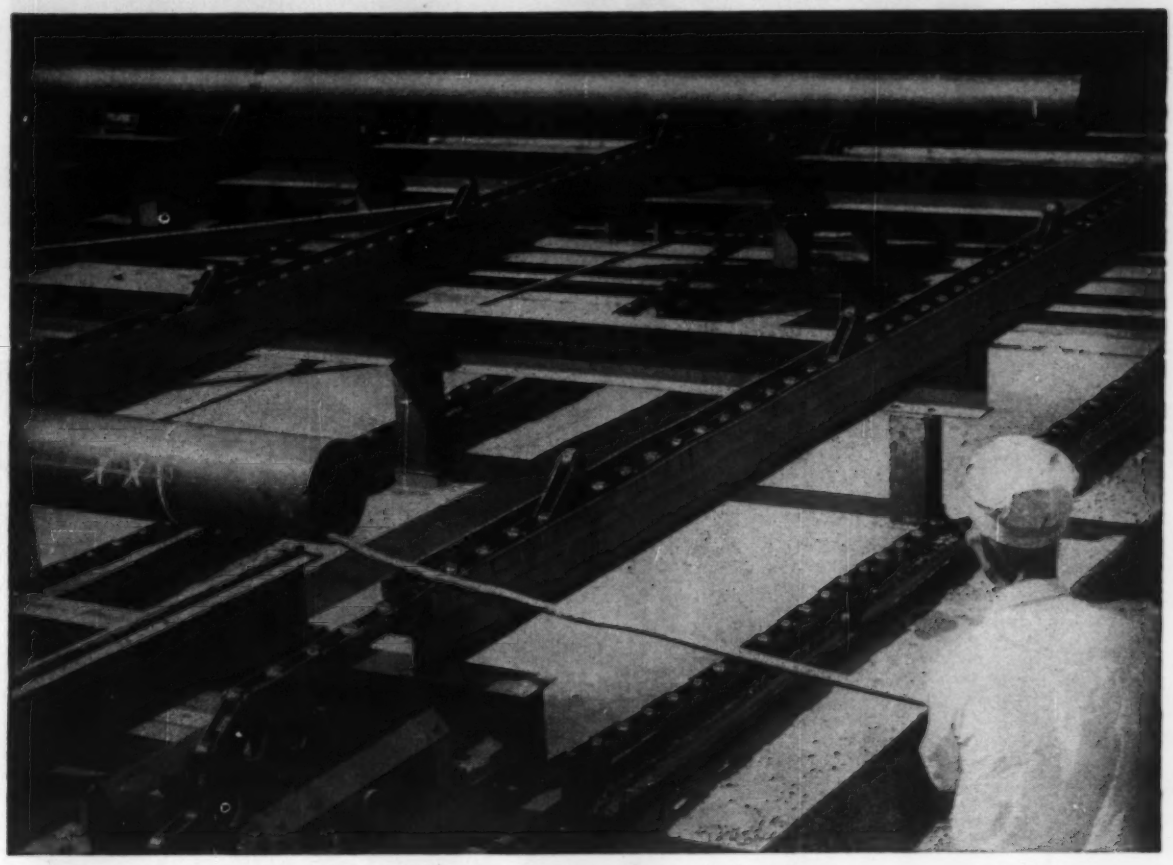
LXS is the chain for this job



Transfer conveyor from inspection to cut-off at steel pipe mill uses Link-Belt LXS chain with attachments to move the heavy pipe smoothly.

Heavy loads, impact, exposure— so LINK-BELT LXS is a natural choice at steel pipe mill

Handling 40-foot lengths of pipe that weigh around 1000 pounds each is a job that demands real stamina in chain. That's why the designers of this pipe mill specified Link-Belt LXS.

Use of selected steels plus accurate sizing and close fit of mating parts gives this chain ruggedness and accuracy. *It's the long-life answer for severe conveyor and drive service.*

And the story's the same for every drive and conveyor requirement — you'll find the chain that's *best* for the job in the complete Link-Belt line. No other single source can equal Link-Belt's broad range of roller and silent chain . . . of cast, combination, forged and fabricated types.

Your nearby Link-Belt office or authorized stock-carrying distributor can give you all the facts. Call today.

No ONE chain serves every purpose — get the RIGHT one from Link-Belt's *complete* line

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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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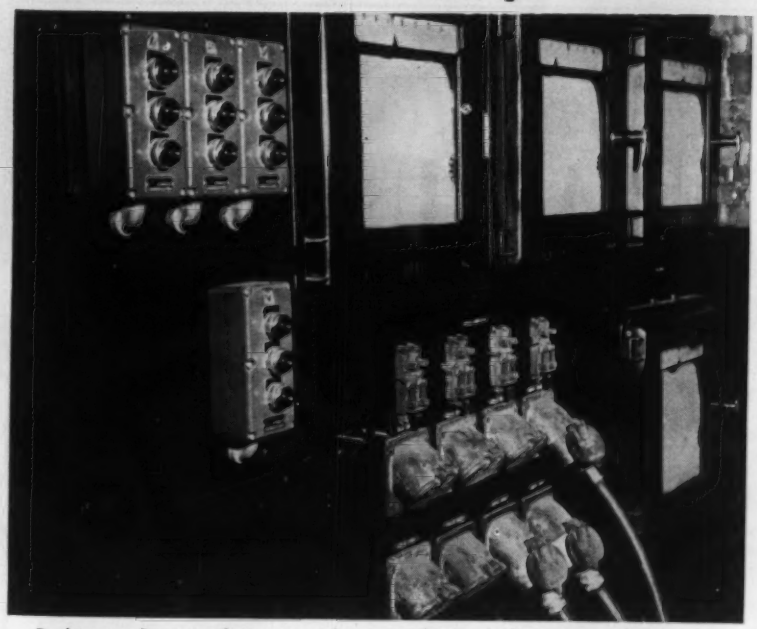
(Advertisement)

Sharon Steel Improves Annealing Temperature Control With New Thermocouple Circuit Monitoring Device



Pushing a Restorer button on the control panel disconnects the appropriate thermocouple circuit from its pyrometer circuits and puts a test voltage on the thermocouple circuit. A red signal light indicates circuit continuity. Pyrometer readings after button is released are accurate.

Restorer Checks Thermocouples Automatically . . .

• Another leading basic steel producer uses automatic Restorer units to verify quick immersion-thermocouple checks of molten steel to be tapped from its open hearths.

Automatic Restorers use the same electrical continuity principle as manual models, but they can be preset to operate automatically. They can also be operated manually, when necessary, by a pushbutton or a key-operated switch.

Automatic Restorers are especially suited for monitoring immersion thermocouples in electric arc furnaces, induction furnaces or open hearths. These couples are often not welded and have many plug-type or screw-type connections that are common sources of poor electrical contact and excessive resistance.

The Restorer assures the accuracy of these critical temperature checks by insuring proper continuity between couple and pyrometer.

Seven coils of flat rolled strip steel are ready for annealing at Sharon Steel Corporation. Control couple near top cannot be reached for repair or replacement during heats. Literature available upon request.

Restorer Prolongs Thermocouple Life, Cuts Maintenance of TC Circuits . . .

• Closer annealing temperature control, longer thermocouple life and reduced maintenance on thermocouple circuits and pyrometers has been effected at Sharon Steel Corporation's Roemer Works, Sharon, Pa.

Annealing General Foreman D. H. Jones reports his furnace operators and plant instrument men have made the improvement with the aid of a device for monitoring thermocouple circuits during heat treating operations. The unit is the Restorer, produced by The Peerless Electric Company, Warren, Ohio.

The first Restorer unit, installed on trial in June, 1953, permitted Annealing personnel to repair many couple failures "on the spot" without calling instrument men. Restored couples remained accurate during heats, instead of being replaced at the first sign of failure. Less time was spent checking pyrometers because couple failures account for the majority of troubles.

Sharon Steel installed five more Restorers in late 1953 to check more than 200 thermocouple circuits on its 23 annealing furnaces. This year the firm added new units and will again install Restorer monitor stations.

The furnaces anneal flat rolled steel strip produced by Sharon Steel.

The
PEERLESS ELECTRIC COMPANY
1453 W. MARKET ST.
WARREN, OHIO
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Manufacturers of
MOTORS • FANS • BLOWERS
ELECTRONIC EQUIPMENT

NOW FROM SCIAKY . . .

the most significant development in the history of resistance welding

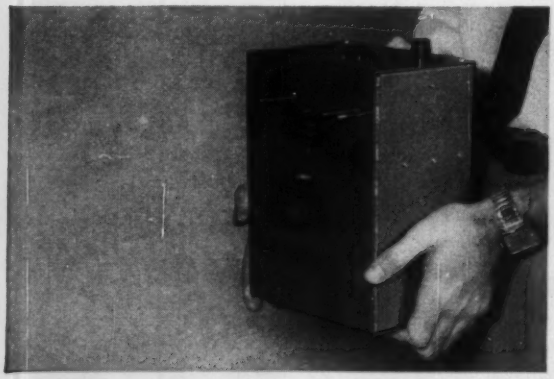
AT LAST,
ABSOLUTE ACCURACY
IN WELDING CONTROL

The Sciaky Predetermined Electronic Counter Weld Control Produces Absolute Weld Consistency and Positive Reproducibility

To the long line of Sciaky firsts in resistance welding is now added the most important of them all—the Sciaky Predetermined Electronic Counter Weld Control. Now resistance welding can easily and economically provide fastening to satisfy *your* standards of production. . . No matter how rigid they are. . . No matter how long or short your production runs!

THE LOGIC AND SIMPLICITY OF CONCEPT

Without deviation, this new Sciaky control counts the cycles of power line frequency which is governed by the U. S. Naval Observatory. In predetermined absolute numbers the cycles and impulses of the various welder functions are simply counted by a Dekatron tube. A single tube is used to count both the respective cycles of succeeding functions, as well as the impulses of welding current. The positive adjustment snap switch control dials are logically calibrated in these same cycles and impulses.



Close up of a typical unitized, plug-in sub-assembly.

ABSOLUTE CONSISTENCY

Control settings are realized with exactness. No relays are necessary during the entire welding sequence. The unvarying accuracy of counting is maintained throughout the entire range for the longest run at the highest production rate, and is readily reproducible at any time.

Note the ease with which a plug-in new function unit can be added.

EASE OF MAINTENANCE OR ADDITION OF FUNCTIONS

The entire control is designed to permit the greatest possible ease and speed of maintenance or addition of functions through the use of separate plug-in sub-assembly units. Down time is minimized since it takes only minutes to install a spare or an additional function.

WRITE FOR DESCRIPTIVE BULLETINS

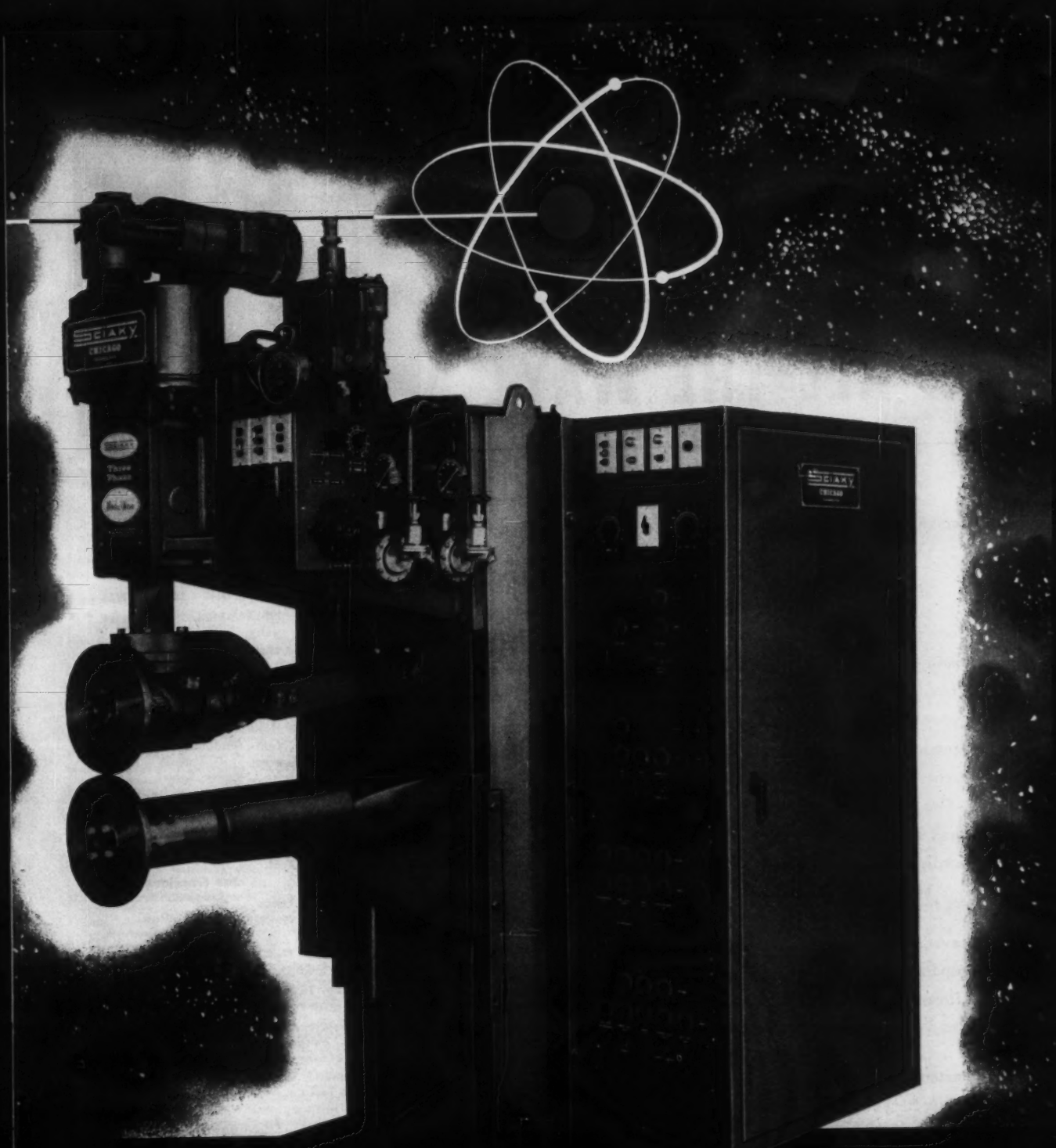
Further technical, operation and application data is presented in Bulletins No. 338 and No. 339. Write or 'phone for your copies, today. There is no obligation.

Sciaky Bros., Inc., 4909 West 67th Street, Chicago 38, Ill., POrtsmouth 7-5600

Largest Manufacturers of Resistance Welding Machines in the World

See it in ACTION

The Sciaky Predetermined Electronic Counter Weld Control will be introduced publicly at the Welding Show in Buffalo, May 9-11. You are cordially invited to see it in action in Booth No. 100.



Sciaky Roll Spot and Seam Welder equipped with the Sciaky Predetermined Electronic Counter Weld Control.

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ALL THE WAY!

Our interest in a Federal Gage doesn't end when we sell it to you. We want you to have the *right* gage and we want to be sure that it *performs* right on the job.

Before you buy a gage, talk over your requirements with one of our engineers. To give you on-the-spot service, we maintain nine wholly owned Branch Offices in the principal manufacturing areas. Each has its own Manager and staff of trained gage engineers who are experienced in the design and use of all modern gages. We also have twenty-one manufacturer's representatives, with their staffs, handily located from coast to coast. Also we have engineers who specialize in certain types of gages and who travel out from the factory at Providence solving out-of-ordinary gaging problems.

After you buy a Federal gage, there's a Federal engineer available to straighten out unforeseen difficulties . . . instruct your operators . . . assure that you receive full value from your gage investment.

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Apr. 23-25, American Zinc Institute and Lead Industries Associations: Combined annual meeting, Hotel Statler, St. Louis. Information: Robert L. Ziegfeld, 420 Lexington Ave., New York 17, N. Y.

Apr. 26-27, Society for Advancement of Management: Management engineering conference, Hotel Statler, New York. Society's address: 74 Fifth Ave., New York 11, N. Y.

Apr. 29-May 3, Electrochemical Society: Spring meeting, Mark-Hopkins hotel, San Francisco. Society's address: 216 W. 102nd St., New York 25, N. Y. Secretary: R. M. Burns.

Apr. 30-May 2, Association of Iron & Steel Engineers: Spring meeting, Lord Baltimore hotel, Baltimore. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

Apr. 30-May 2, Metal Treating Institute: Spring meeting, Roosevelt hotel, New Orleans. Institute's address: 271 North Ave., New Rochelle, N. Y. Secretary: C. E. Herington.

May 2-4, Industrial Fasteners Institute: Annual meeting, Homestead, Hot Springs, Va. Institute's address: 1517 Terminal Tower, Cleveland 13, O. Secretary: R. B. Belford.

May 3-9, American Foundrymen's Society: Biennial convention and show, Convention Hall, Atlantic City, N. J. Society's address: Golf & Wolf Rds., Des Plaines, Ill. Secretary: William W. Maloney.

May 6-9, American Institute of Chemical Engineers: Spring meeting, Roosevelt hotel, New Orleans. Institute's address: 120 E. 41st St., New York 17, N. Y. Secretary: F. J. Van Antwerpen.

May 6-9, American Steel Warehouse Association: Annual meeting, Fairmont hotel, San Francisco. Association's address: 442 Terminal Tower, Cleveland, O. Executive secretary: Robert G. Welch.

May 6-9, Liquefied Petroleum Gas Association Inc.: Annual meeting and exhibit, Conrad Hilton hotel, Chicago. Association's address: 11 S. LaSalle St., Chicago 1, Ill. Secretary: Arthur C. Kreutzer.

May 7-9, American Mining Congress: Coal convention, Netherland Plaza, Cincinnati. Congress' address: 1102 Ring Bldg., Washington 6, D. C. Executive vice president and secretary: Julian D. Conover.

May 7-11, American Welding Society: National spring technical meeting and welding show, Hotel Statler and Memorial Auditorium, Buffalo. Society's address: 33 W. 39th St., New York 18, N. Y. Secretary: J. G. Magrath.

May 9-11, Investment Casting Institute: Spring meeting and exhibit, New Yorker hotel, New York. Institute's address: 27 E. Monroe St., Chicago 3, Ill. Executive secretary: Harry P. Dolan.

May 9-11, American Management Association: Insurance conference, Hotel Roosevelt, New York. Association's address: 1515 Broadway, New York 36, N. Y. Vice president-secretary: James O. Rice.

May 10-11, Refractories Institute: Annual meeting, Grand hotel, Point Clear, Ala. Institute's address: 1801 First National Bank Bldg., Pittsburgh 22, Pa. Executive secretary: Avery C. Newton.

May 14-15, National Association of Sheet Metal Distributors: Spring meeting, Roosevelt hotel, Pittsburgh. Association's address: 1900 Arch St., Philadelphia 3, Pa. Executive secretary: Thomas A. Fernley Jr.

May 14-16, National Industrial Service Association: Annual meeting and exhibit, Bellevue-Stratford hotel, Philadelphia. Association's address: 818 Olive St., St. Louis 1, Mo. Executive secretary: Fred Wipperman.

May 14-17, Design Engineering Show: Convention Hall, Philadelphia. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

May 16-18, Anti-Friction Bearing Manufacturers Association Inc.: Annual meeting, Princeton Inn, Princeton, N. J. Association's address: 60 E. 42nd St., New York 17, N. Y. Secretary: H. O. Smith.

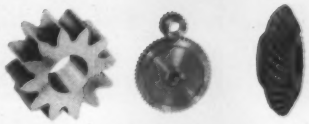
HANDYMAN'S DELIGHT! by Shopmaster

Shopmaster 8" Tilting Arbor Circle Saw, Model HS-56

with Sewall Gears for professional accuracy

Shopmaster's new 8" tilting arbor circle saw buzzes with features to excite the Do-it-yourselfer. This "workshop-in-itself" performs shaping, dadoing, sanding plus ripping and cross-cutting . . . all with professional accuracy thanks to precision machined internal parts and gears made to Shopmaster's exacting specifications.

Sewall's complete gear service can help you . . . call us!



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Made-to-order sprockets

Special gear racks—to order

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Our reputation is based on quality, service and price. If you're like our regular customers you're vitally concerned with these three factors when you buy gears. (1) Gears must meet your specifications exactly, in strict accordance with your prints. (2) Gears must be delivered as scheduled. (3) The price must be reasonable. Sewall gears are made by men who are fussy about specifications. We have a wide range of late-model machine tools, inspection instruments and checking equipment regularly serving customers across the nation. Our large modern plant is handy to rail, truck and air transportation.

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Write for New 4-page Bulletin

The Sewall Story . . . richly illustrated with in-plant photos . . . includes listing of capacities and facilities.

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. . . a boost for screw machine output!

The Success of SpeedKut A . . . is an oft repeated story of increased output, better tool life and less downtime. For SpeedKut A is one of Stuart Oil Company's balanced, general purpose cutting oils specifically designed for high speed machining of free-machining screw stock and brass on single spindle and multiple spindle automatic screw machines, turret lathes, milling machines, and hobbing machines.

SpeedKut A is a product of Stuart's sulphochlorination processing that provides absolute uniformity and stability. Highly effective chemical additive materials are pre-balanced under strict laboratory supervision to instill SpeedKut A with the anti-weld and friction reducing characteristics necessary to the range of machining operations for which it is recommended.

When selecting a cutting fluid, factors to be considered are material being machined, material hardness, speeds, feeds, depth of cut and machine design. Cullman Wheel Company, Chicago, Ill., a leading sprocket manufacturer, took all these factors into consideration more than 10 years ago. They chose SpeedKut A then and still use it for their multi-spindle automatics to cut sprocket blanks from free machining bar stock and for hobbing the sprocket teeth.

Your operation may be another link in this success story of SpeedKut A . . . or perhaps the factors that must be considered indicate a different type of balanced cutting fluid. "The Man in the Barrel", your Stuart Representative, will help you take all of the factors into consideration. Consult him. You'll be happy you did.

Write for Stuart's Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder. It's a quick guide to starting recommendations for any job. Your name and title on a company letterhead is all that's needed.

D. A. STUART OIL CO. LTD.
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Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

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* Sales Appeal

Attraction — Car dealers report the rich, luxurious interiors, made possible only through the generous use of stainless steel trim, have a definite sales appeal to modern day car buyers. But that's only half of it!

Lasting Beauty, that resists corrosion, absorbs abuse and wear, yet returns to its "new car" brightness and color when wiped with a damp cloth, convinces buyers even more that the accent metals of their new car must be of stainless steel.

Automotive Suppliers: Sharon has, since the beginning, been a prime supplier of stainless steel to the automotive industry. For full information in all types of this metal applicable to your industry, contact the Sharon office nearest you or write direct.

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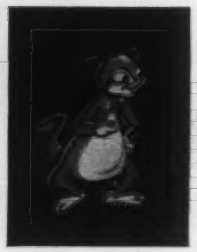


Duplication

Duplication

KOPY-KAT Duplication

is a direct hydraulic transfer with no intermediate motions

machining is completely automatic

there is no chance for irregularities or error in final work

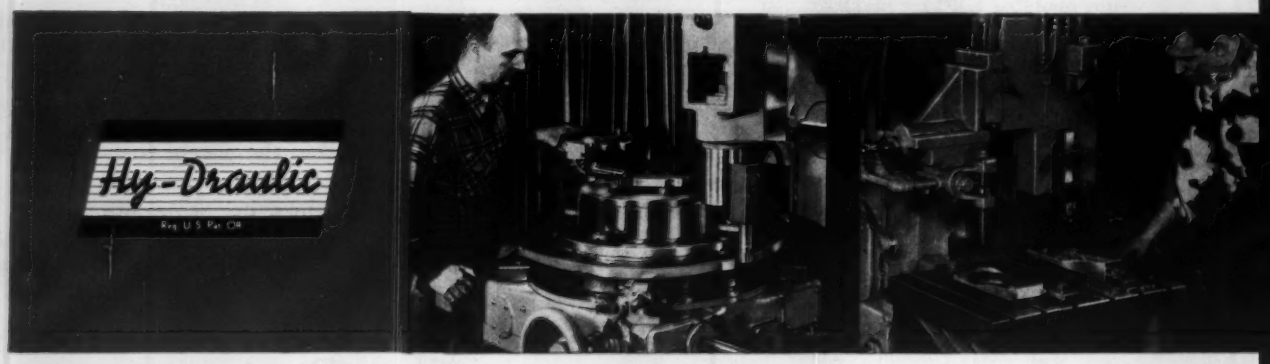
The KOPY-KAT is adaptable to an endless variety of duplicating jobs, from the simplest to the most complex. Manufactured specifically by Rockford Machine Tool Co. for use on new machines, it becomes an integral operating part of any hydraulic shaper, planer or slotter on which it is installed.

Investigate the KOPY-KAT which duplicates automatically with the ease of straight-production machining . . . and faithfully reproduces many forms previously considered impossible to machine.

Ask a Rockford Machine Tool Co. representative for further information . . . or write directly to us.

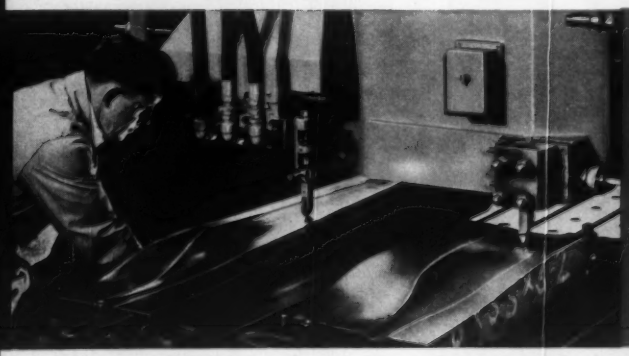
Kopy-Kat Installed on Hydraulic Slotter

Kopy-Kat Installed on Hydraulic Ram Shaper



SHAPERS · PLANERS · SLOTTERS · SHAPER-PLANERS · LATHES

Kopy-Kat Installed on Hydraulic Planer



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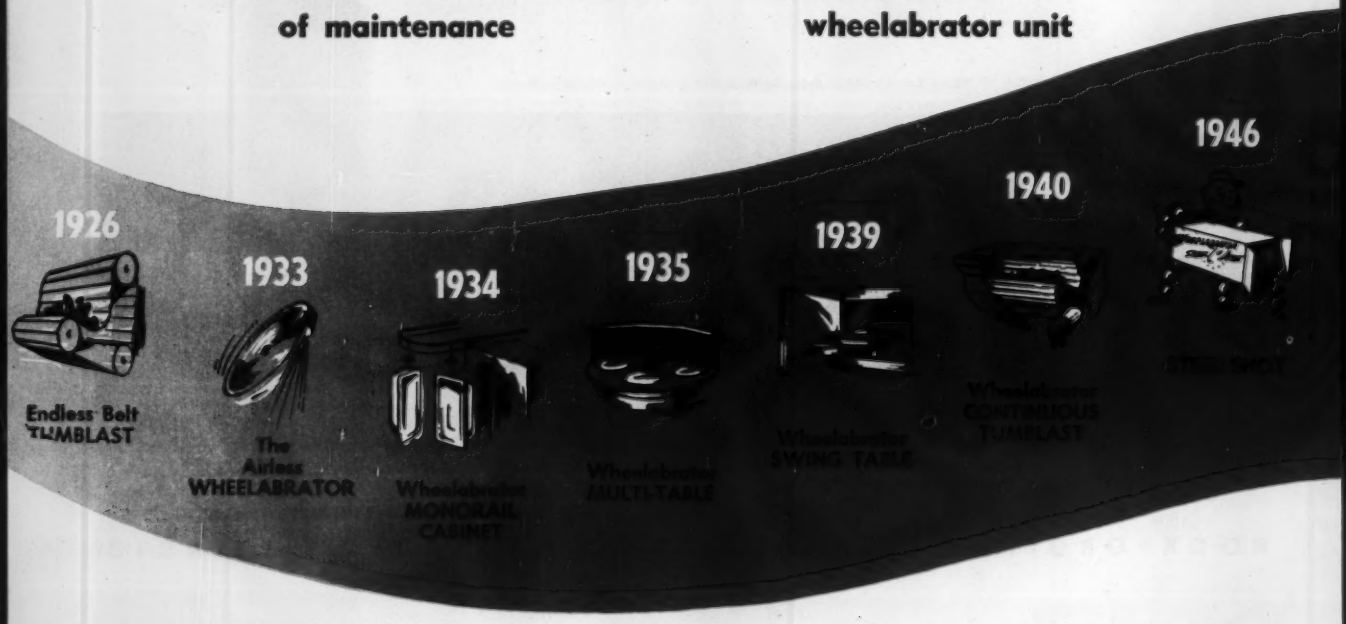

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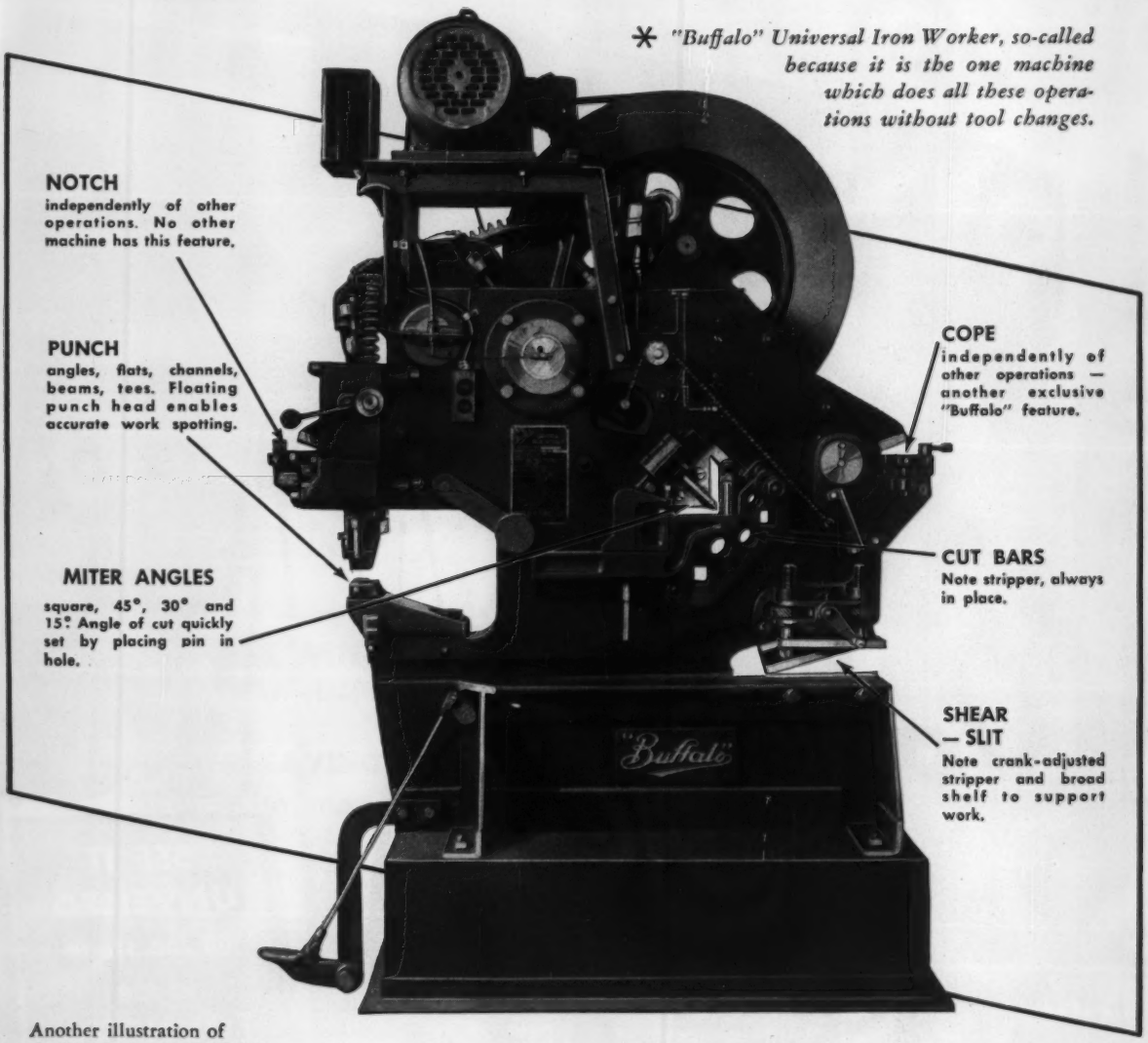
World's Largest Builders of Airless Blast Equipment

YOU CAN DO MORE JOBS IN LESS TIME — WITH A U.I.W.*

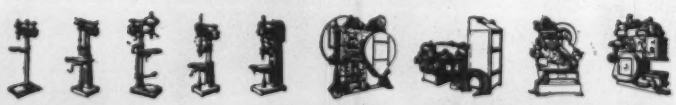
* *"Buffalo" Universal Iron Worker, so-called because it is the one machine which does all these operations without tool changes.*


NOTCH
independently of other operations. No other machine has this feature.
PUNCH
angles, flats, channels, beams, tees. Floating punch head enables accurate work spotting.
MITER ANGLES
square, 45°, 30° and 15°. Angle of cut quickly set by placing pin in hole.
COPE
independently of other operations — another exclusive "Buffalo" feature.
CUT BARS
Note stripper, always in place.
SHEAR — SLIT
Note crank-adjusted stripper and broad shelf to support work.
Buffalo

Another illustration of the "Q" Factor in "Buffalo" machines—*the built-in Quality which provides trouble-free satisfaction and long life.*

A Universal Iron Worker will save space — time — excessive conveying of work from machine to machine in your shop — because it does so many jobs. Often called the "most useful machine in the shop". For complete details, write for Bulletin 360.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.



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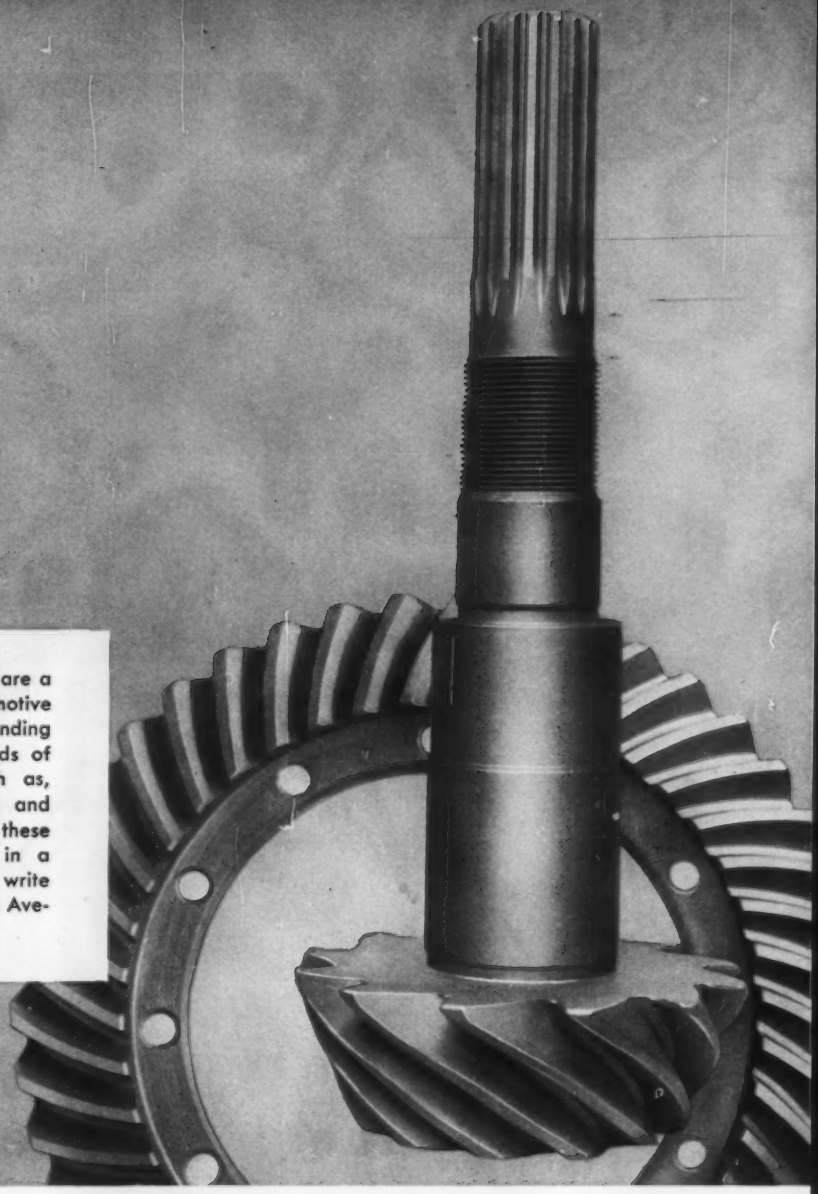


Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 3.

Molybdenum Carburizing Steels

MOLYBDENUM OFFERS THE ECONOMICAL KEY TO PERFORMANCE

Over the years, molybdenum carburizing steels have proved their merits in scores of applications and at every level of production.

Design engineers know moly steels for their uniform hardenability, toughness and wear resistance.

Production men know that moly steels are easy to heat treat, easy to machine.

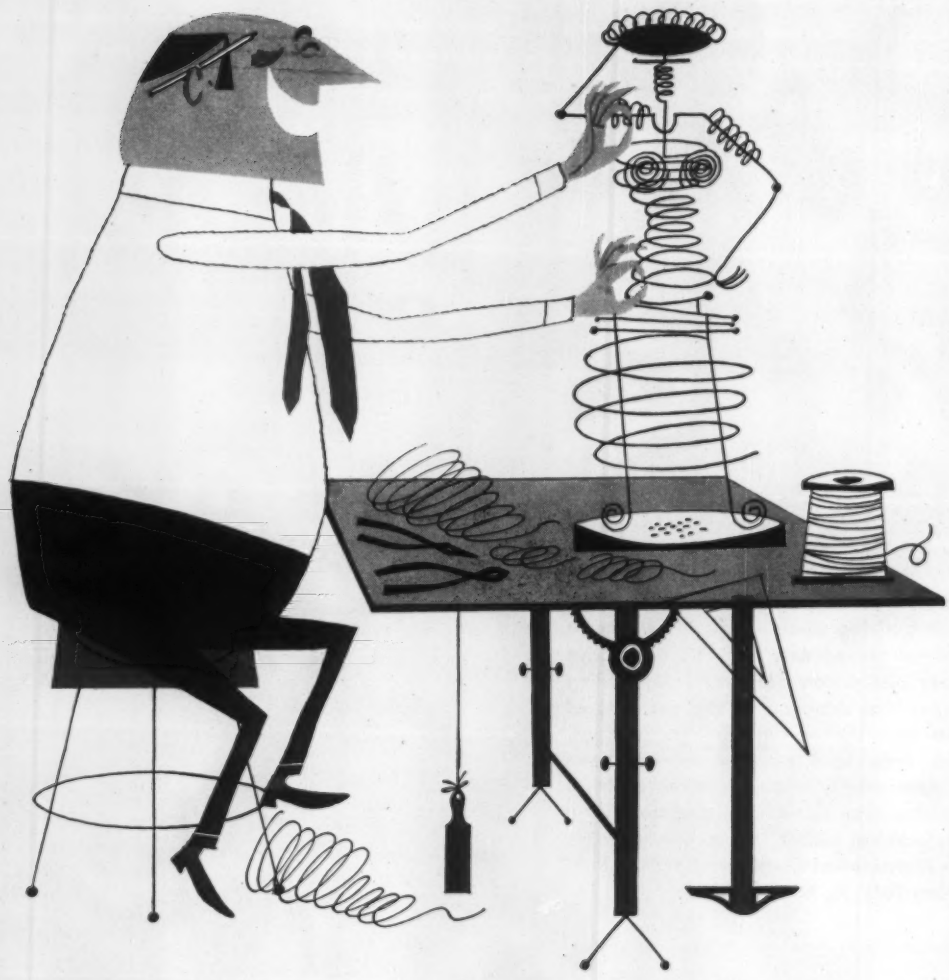
Management knows that moly steels mean economy in fabrication, high performance in a wide range of end products.

Standard molybdenum carburizing steels are widely available. Higher moly analyses may be ordered in heat lots from a number of leading suppliers.

CLIMAX MOLYBDENUM

Use the Moly Key to better carburizing steels

- High case hardness
- Wide choice of hardenability
- Easy to heat treat
- Low distortion
- Good machinability
- Good wear resistance



Designing a new wire product?

Call American Steel & Wire!

Steel wire comes in so many different grades, shapes and finishes that it isn't easy to keep them all at your fingertips.

For this reason, we suggest that you give your American Steel & Wire representative a chance to help with new designs while they are still on the drawing board. He may be able to suggest 1) a more economical wire, 2) a wire that will fabricate more easily or 3) a slight design change that will simplify production or lower the cost of the raw material.

At AS&W, we *use* a lot of wire in our own plants; and have learned many little tricks that are yours for the asking. Just call your American Steel & Wire representative.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
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USS AMERICAN MANUFACTURERS WIRE

USS

AMERFINE—*high quality fine wire.*
AMERSPRING—*music steel spring wire.*
AMERTEMP—*heavy-duty oil-tempered wire.*
AMERLOY—*alloy heading wire.*
AMERHEAD—*uniform heading wire.*
AMERSTITCH—*extra-tough metal stitching wire.*

UNITED STATES STEEL

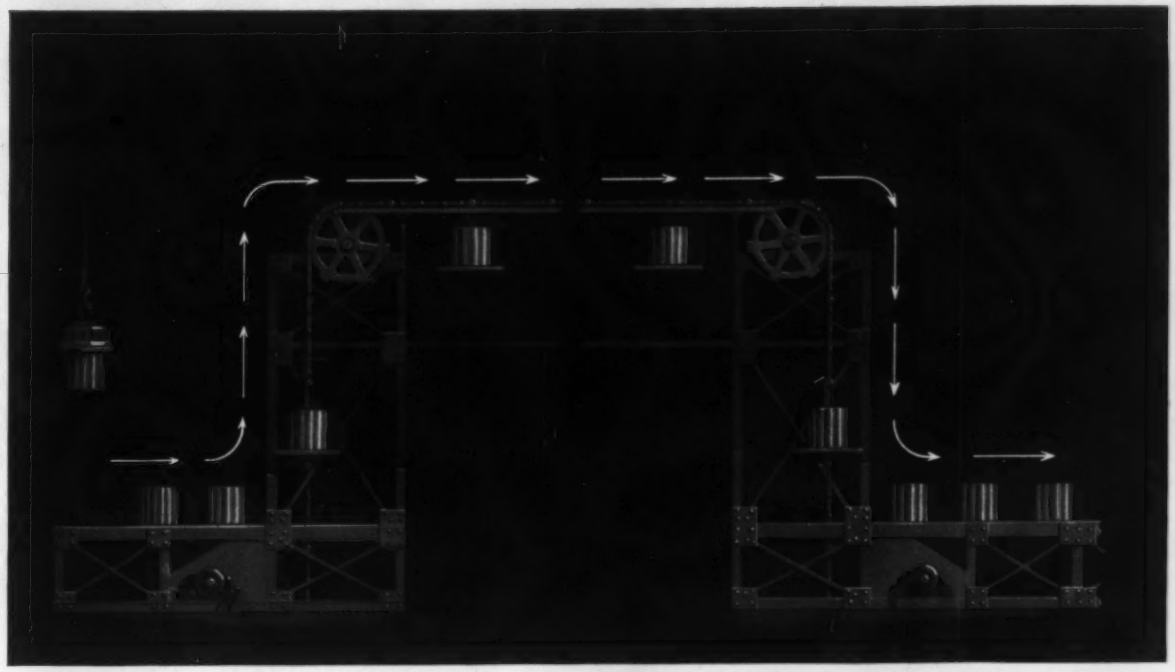
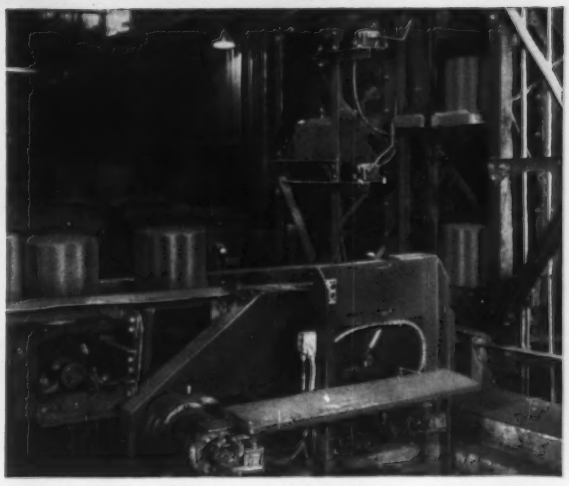


Diagram of the JEFFREY continuous automatic ingot conveyor system at Standard Steel Works Division, Baldwin-Lima-Hamilton Corporation, Burnham, Pennsylvania.

75% saving in handling



Ingots start their trip to the rolling mill here. No more delays for batch-loading onto flat cars.

credited to this JEFFREY Conveyor System

Rising vertically for 20 feet, leveling off to a 25° incline across railroad tracks and a road, horizontally for another 57 feet, then descending to the receiving station—that's the aerial route taken by this JEFFREY conveyor. Transfer time, 3¼ minutes. Distance traveled, 168 feet, compared to a mile when railroad cars were used for this task.

Little labor is required, since a spring-mounted gravity roller conveyor automatically feeds the one-ton ingots to the chain gathering conveyor. The tray conveyor picks them up there and carries them to the rolling mill, where they travel past the weighing station on chain conveyors to the unloading point.

There's considerable saving, too, on badly needed storage space. Ingots move away at a rate of four per minute, so they don't pile up in the open hearth shop.

Write for catalogs containing complete information on JEFFREY handling equipment. The Jeffrey Manufacturing Company, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

SOME OF THE REASONS YOU GET BETTER SERVICE WITH KAISER PERICLASE-CHROME BRICK:

1. Low permanent growth from iron-oxide attack minimizes end wall buckling and spalling.
2. A ceramic bond is formed *before* the chemical bond is destroyed.
3. No liquid phase in forming its ceramic bond. Volume stability.
4. High MgO content in end wall brick provides greater resistance to carryover erosion and iron oxide attack.
5. Lowest porosity minimizes alteration by resisting penetration of gases and impurities.

CHEMICALS
KAISER
REFRACTORIES

Expansion tests show why you get SUPERIOR END WALL SERVICE with Kaiser Periclase-Chrome Brick

ONE REASON why Kaiser Periclase-Chrome Brick assures better end wall service for many leading steel producers is shown by this laboratory test of the effect of steel plates on permanent growth.

In this test, pre-fired 9x4½x3" bricks of two types were compared: brick having a chrome-magnesite ratio of approximately 75 to 25, and Kaiser Periclase-Chrome Brick.

Both types of brick were laid up as headers, forming the side walls of a tangentially fired pot furnace. 16-gauge steel plates were applied to the four sides of the bricks. The bricks were set loosely, with only 4 courses of brick overlaying the test pieces.

The effects produced in the laboratory were the result *solely of the heating and iron oxide reaction*. Heating and atmosphere conditions were identical on each type of brick. The furnace was heated with gas to 3100°F. ± 25°, and held at this temperature for 16 hours. Heating and cooling was at the rate of 75°F. per hour to minimize thermal spalling effects.

Results of the test

After cooling, the bricks were separated and photographed. (See picture.) Note strings stretched from top corners of new brick on ends of each row. Comparative growth on hot faces of brick shows above strings. The upper row of brick is the chrome-magnesite type. The maximum linear cold expansion of these bricks was 1" or 11%, with an average of 9%.

The lower row of bricks are Kaiser Periclase-Chrome. The maximum linear cold expansion of the Kaiser brick was only 3/16" or 2.1%, with an average of only 1.4%.

These values are in addition to the reversible thermal expansion, in each case.

Also, note in the picture the cracking of the chrome-magnesite type brick caused by the relatively great iron-oxide swelling. The Kaiser Periclase-Chrome Brick is free from such cracks.

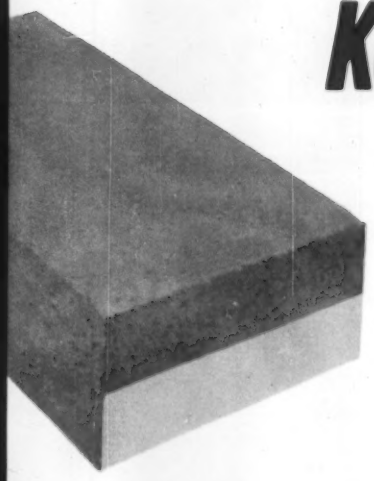
The superiority of Kaiser Periclase-Chrome Brick

This test indicates only one of many reasons why Kaiser Periclase-Chrome Brick gives open hearth operators better end wall service.

The special composition of Kaiser Periclase-Chrome Brick assures less spalling, less swelling, greater resistance to abrasion and alteration by oxide and slag. This superior brick can greatly increase end wall life or greatly reduce wall thickness to cut costs, when end wall service is balanced.

Call or write any of the sales offices listed below for immediate attention to your end wall particular problems.

Kaiser Chemicals Division, *Kaiser Aluminum & Chemical Sales, Inc. Regional Sales Offices: 1924 Broadway,* OAKLAND *12, Calif. . . . 3 Gateway Center,* PITTSBURGH, *Pa. . . . 518 Calumet Building, 5231 Hohman Ave., Hammond, Indiana* (CHICAGO).



Kaiser Chemicals

Pioneers in Modern Basic Refractories

REFRACTORY BRICK • RAMMING MATERIALS • CASTABLES & MORTARS • MAGNESITE • PERICLASE • DEADBURNED DOLOMITE

Kaiser PERICLASE Brick for the Steel Industry:

- Periclase Brick (D-S)
- Periclase Chrome Brick
- Chrome Periclase Brick

(Advertisement)

"GAS helps us bend and fabricate pipe faster, better"

Dravo Corporation

Gas mixed with oxygen provides a hot flame for direct application to the pipe in this alignment process at Dravo's Marietta, Ohio plant. Dravo finds that Gas does a faster, better job than the fuel previously used in this operation and is typical of the many ways Gas helps them in bending and fabricating pipes.

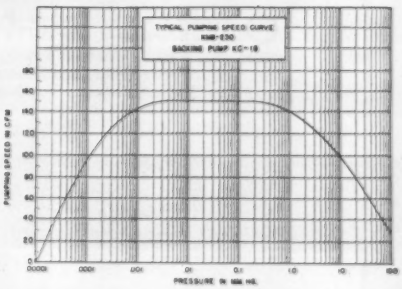
Gas is also used for preheating, stress relieving and heat treating at Dravo. Gas torches preheat alloy and carbon steel in preparation for welding. Gas-fired stress relieving furnaces permit controlled temperatures for specified heats. Also, Dravo's three bending furnaces are fired with Gas to heat pipe to temperatures suitable for hot bending of pipe.

For information on how Gas can help you in your production operations, call your Gas Company industrial specialist. He'll be glad to discuss the economies and outstanding results you get with Gas and modern Gas equipment. *American Gas Association.*

There's an addition to KINNEY'S MECHANICAL BOOSTER VACUUM PUMP FAMILY... the new Model KMB-230!

FOR VACUUM MELTING, the design and ultimate production of the Model KMB-230 was a natural. It provides a 230 CFM pump for those vacuum metallurgy installations where the Kinney workhorse (the Model KMB-1200) was too large. Of similar design (the KMB-230 is combined with a Model KC-18 for roughing out purposes), it offers the same dependable, trouble-free service . . . the highest volumetric efficiency, and highest dollar return per CFM available in any high vacuum pumping system.

FOR *YOUR* METALLURGICAL VACUUM PROCESSING SYSTEM, investigate the outstanding performance records of these Kinney pumps. We will be glad to provide you with any vacuum data you need . . . to make your operation more economical. Contact any of our competently staffed district offices . . . in Baltimore, Chicago (La Grange), Cleveland, Detroit, Houston, Los Angeles, New Orleans, New York, Philadelphia, San Francisco, or St. Louis . . . or mail coupon today for additional information. Take time to make one of your smartest moves. Kinney Mfg. Division, Boston 30, Massachusetts.



SPECIFICATION DATA

Model **KMB-230** Two Stage Mechanical Booster Vacuum Pump

Ultimate Pressure (McLeod Gauge)	0.1 Micron
Free Air Displacement	230 CFM
RPM	3600/640
Motor H.P.	2 and 1
Oil Capacity	5 Pints
Cooling	Water
Shaft Seal	Mechanical
Shaft Diameter	¾/¾
Inlet Connection	4" Flanged
Outlet Connection	1¼" Screwed
Net Weight, Complete	1010 lbs.

write today

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THE NEW YORK AIR BRAKE COMPANY
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- Please send Catalog No. 425 describing the complete line of Kinney Vacuum Pumps.

Our vacuum problem involves.....

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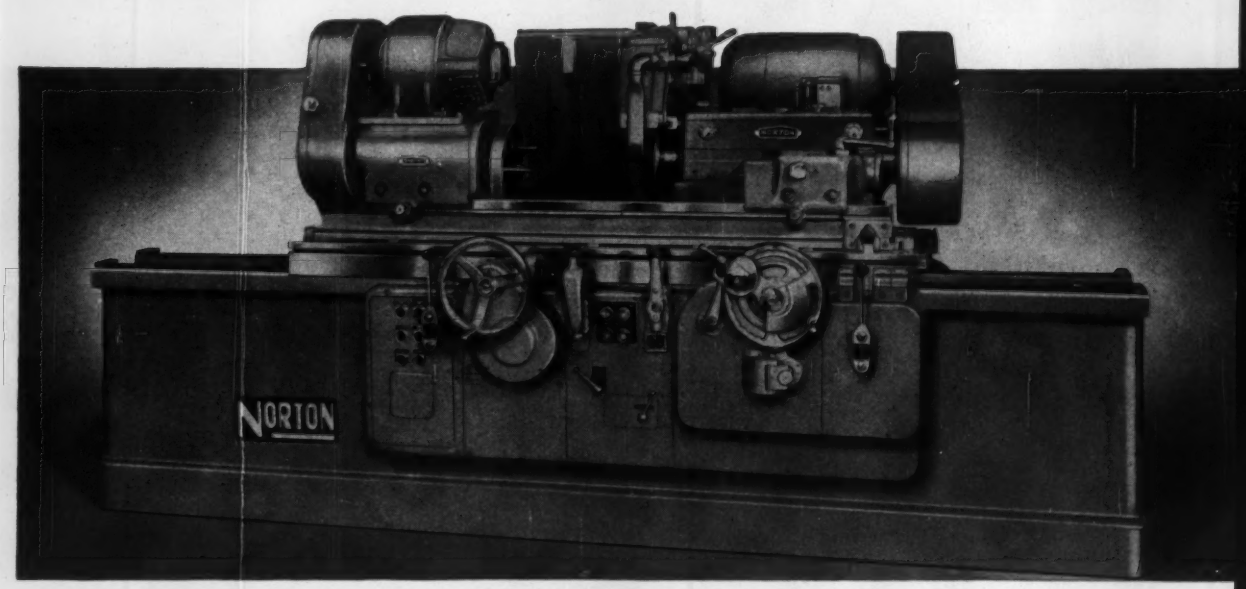
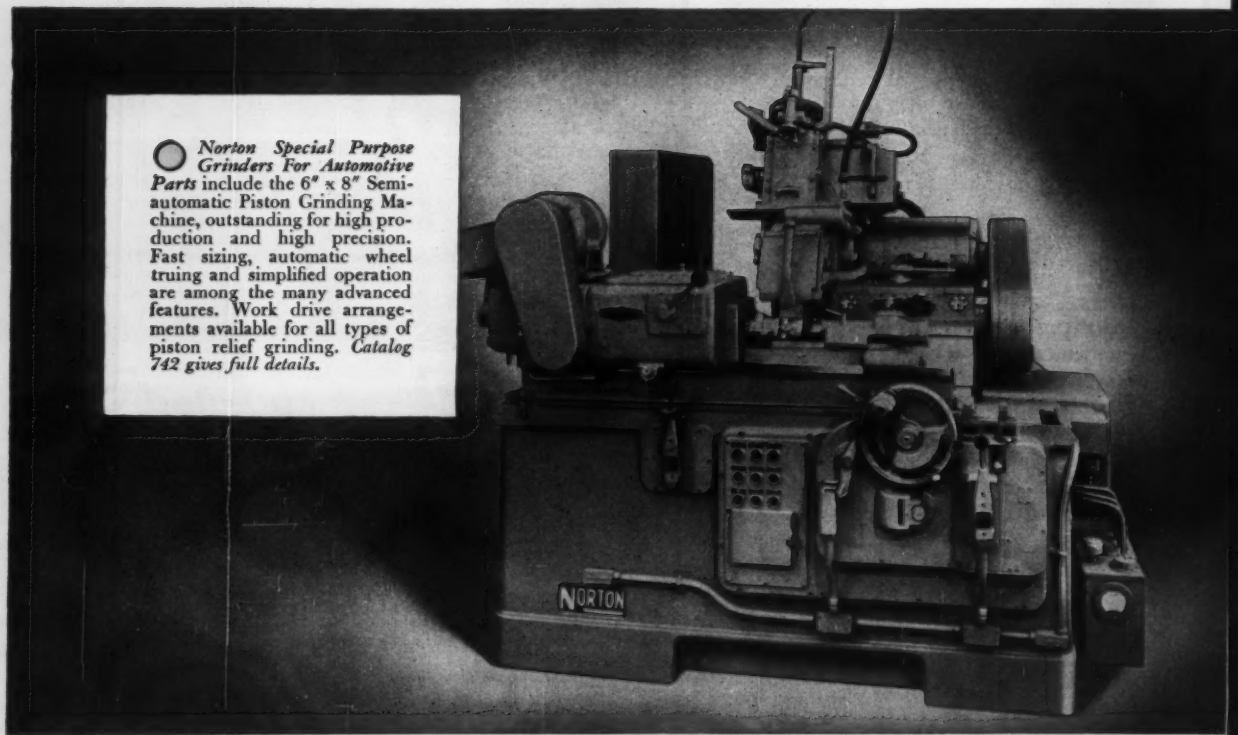


○ *Norton General Purpose Production Type Cylindrical Grinders.* The 10″ x 36″ Type CTU Semi-automatic, a top performer among grinding machines of this type, offers a unique combination of speed, accuracy, flexibility and sturdiness. One-lever control of the automatic grinding cycle reduces operator's duties to loading and unloading. Production line and job shop users report Norton 10″ CTU's have doubled production, replaced several machines, eliminated extra operations. *Write for Catalog 1787.*

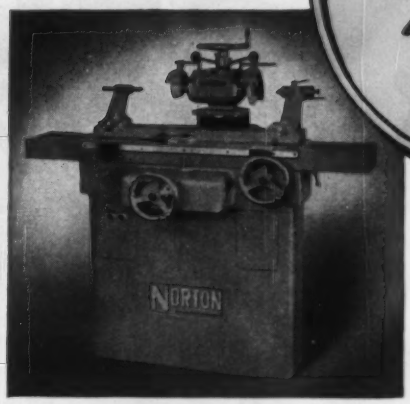
○ *Norton Special Purpose Grinders For Automotive Parts* include the 6″ x 8″ Semi-automatic Piston Grinding Machine, outstanding for high production and high precision. Fast sizing, automatic wheel truing and simplified operation are among the many advanced features. Work drive arrangements available for all types of piston relief grinding. *Catalog 742 gives full details.*



complete line of

money-saving grinders and lappers

Norton Surface Grinders are well represented by this 8" x 24" Hydraulic Grinder. Designed with both hand and power table traverse and cross feed, it produces plane surfaces smoothly and speedily. Convenient controls and easy accessibility keep operating and maintenance times low. Extra equipment, such as magnetic chucks, wet grinding attachment and individual dust exhaust system meet all operating conditions. *Write for Catalog 190.*



Norton Tool Room Cutter Grinders. The No. 20 Cutter and Tool Grinder is the most versatile machine in its class. The wheel head tilts up to 15° above or below horizontal, and may be swivelled through 360° — simplifying such jobs as grinding taper reamers, step counterbores, form tools and milling cutters. Other pace-setting advantages include long table traverse and wheel slide travel . . . integral motor spindle . . . wheel slide graduated dials readable from any angle. No other cutter and tool grinder does so many jobs so fast, so easily. *Catalog 189 tells you why.*

Norton Lapping Machines. The Type 16FC Vertical Lapper brings you outstanding production capacity for such work as diesel injector parts, plug gages, size blocks, sides of small bearing races, pump gears and plates and many other parts. Laps flat work up to 3" x 5", and cylindrical work up to 3" diameter, producing a high degree of accuracy and finish. *Catalog 212 gives you details.*

Only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.

The six machines shown here are typical products of that experience — bringing you ahead-of-the-parade design that speeds production and adds maximum product-value on every job they do for you.

But remember — these six advanced machines represent only a small fraction of the world's broadest line. Besides many models of cylindrical, surface, crankshaft and camshaft grinding machines, Norton produces a wide range of lapping machines, tool room grinders and special types for grinding pistons, valves, jet parts, etc.

A new illustrated folder #1843 lists the entire Norton line of grinding and lapping machines and tells you how to get all the facts on each unit. For your copy, write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

District Sales Offices: Worcester • Hartford • New York
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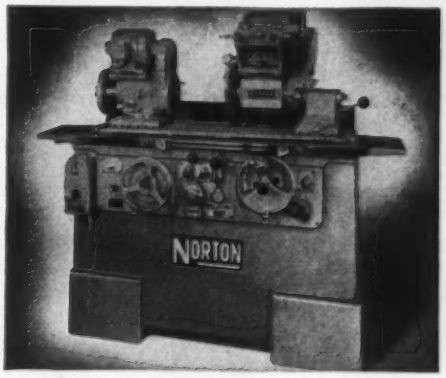
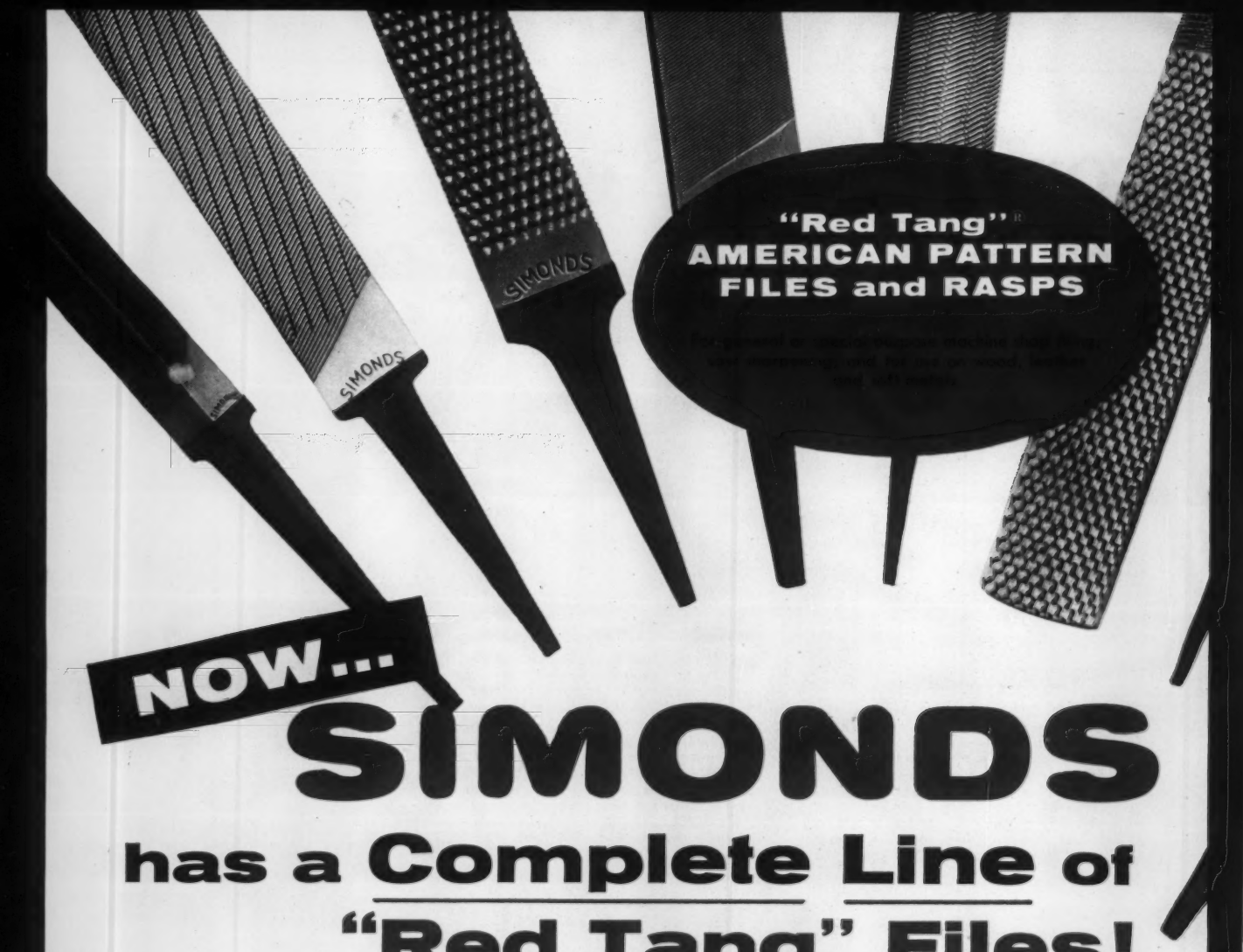


Norton 10" Universal Grinders. The 10" x 20" Universal Grinder has the flexibility to handle an almost endless variety of jobs. Compound swivel arrangement of wheel head enables you to make separate angular settings of wheel and feed. External, internal, face or angular wheel slide operations are easy. Chuck may be mounted on one end of work head spindle, ready for use by turning head 180°. *Write for Catalog 170.*



"Red Tang" AMERICAN PATTERN FILES and RASPS

NOW...

SIMONDS

has a Complete Line of "Red Tang" Files!

Simonds now offers you all types of files in the Right Length, the Right Shape and the Right Cut for every filing job. What's more, Simonds Files are Grade A, First Quality only . . . backed by Simonds reputation for outstanding quality, dependability and service.

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SAW AND STEEL CO.
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Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
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Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
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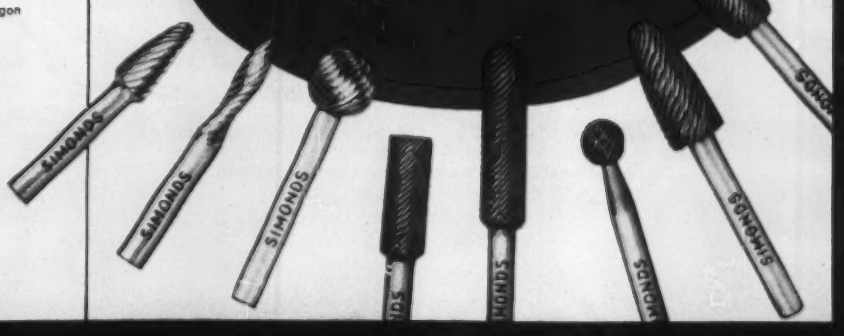
For Fast Service from Complete Stocks
Call your
SIMONDS Industrial Supply DISTRIBUTOR

ROTARY FILES



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SWISS PATTERN
FILES
VIXEN
Milled Curved-Tooth
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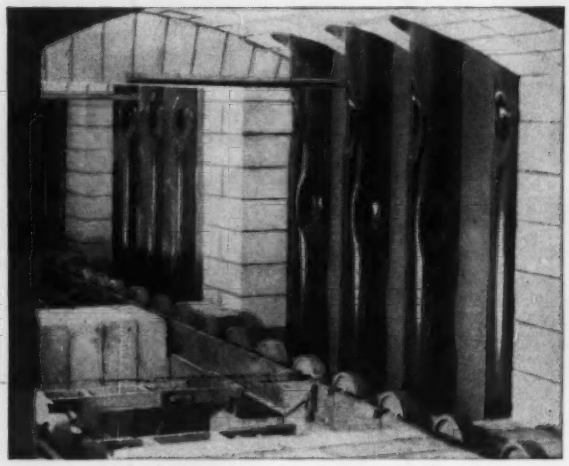
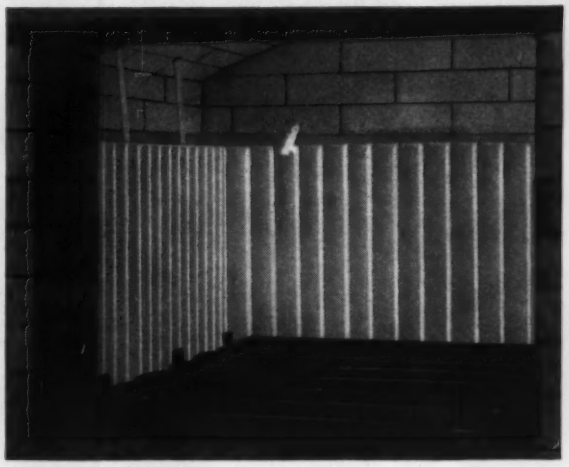
SIMONDS
SIMONDS

Whatever your source of heat...

LINDBERG HEAT TREATING FURNACES OFFER THESE EXCLUSIVE ADVANTAGES





. . . IN THE GAS-FIRED FURNACE
NEW LINDBERG VERTICAL RADIANT TUBE

Because of its revolutionary design, this tube provides a new level of gas-fired furnace performance. The secret lies in the new Lindberg tube's "dimples." The tube carries a central stream of mixed air-and-gas surrounded by a cylindrical stream of air alone. Combustion occurs in the area between these two streams. The "dimples" create eddies accelerating combustion and maintaining even temperatures along the entire tube.

This Lindberg tube will operate at maximum efficiency for a longer period of time. The special protective coating gives greatest possible resistance to carbon penetration. Vertical position eliminates soot deposit and resultant temperature increases at points of sooting.

Tubes are 59 inches long, weigh only 29 pounds, changeable in a few minutes. No costly furnace shutdowns nor high labor and material cost for tube changes.

. . . IN THE ELECTRIC FURNACE
NEW LINDBERG CORRTHERM ELEMENT

CORRTHERM, Lindberg's radically advanced new electric heating element offers advantages never before available for heat treating furnaces. With this new element carburizing and carbonitriding with electricity becomes practical, efficient and economical. Ideal, too, in other types of Lindberg electric furnaces.

The outstanding feature of the CORRTHERM element is the extremely low voltage at which it operates. Consequently, leakage through carbon saturation and shock or short hazards are eliminated. Elements also act as baffles to direct circulation of convection streams.

CORRTHERM elements are practically indestructible. Work load or operator's charging tool can't hurt them. Watts density is at all time low. Easily installed or replaced, too, as element merely hangs in furnace and no complicated mountings are required.

Lindberg Field representatives in 21 cities are ready to show you how Lindberg furnaces with these revolutionary new elements can improve your heat treating process. You'll find your Lindberg representative's name in the classified section of the phone book or write us direct.

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY
2441 W. Hubbard Street • Chicago 12, Illinois

Plants improve plating operations with unique chromium process

♦ **Operating costs cut, production stepped up by Unichrome SRHS® Chromium Plating Process**

♦ **Better plate also reported . . . many hundreds of plants now profiting**

For years, many platers have had good opportunities to check results from ordinary chromium baths and from Unichrome SRHS Chromium. Here are just a few typical comparisons.

REJECTS MINIMIZED

At one company, intricate parts caused chromium plating coverage difficulties. On occasion, rejects due to the plate "missing" ran as high as 25%. Yet with SRHS Chromium and its wider bright plating range, work covered easily, with a reject rate under 0.4%. Foreman at another plant told of reducing rejects due to "burning" of the plate and eliminating color-buffing when the SRHS Bath was installed.

PRODUCTION BOOSTED

Unichrome SRHS Solutions increase plating speed. Work which took 3½ hours in ordinary chromium was done with SRHS in 2½ at one shop. Elsewhere, piston rings are being plated in half the former time.

Taking advantage of the higher efficiency of SRHS Chromium, some plants have obtained 30 to 66% more work per *cycle* from existing equipment, and saved power as well.

This process is just one of Metal & Thermit's many Unichrome processes and materials which provide opportunities to cut your finishing costs . . . opportunities to turn out a better product through a better finish. We'd welcome the chance to work with you.

Unichrome is a trade mark of Metal & Thermit.

PLATING MATERIALS
ORGANIC COATINGS
TIN & TIN CHEMICALS
CERAMIC MATERIALS
RADIOGRAPHIC EQUIPMENT
WELDING SUPPLIES
METALS & ALLOYS
HEAVY MELTING SCRAP

UNICHROME

METAL & THERMIT
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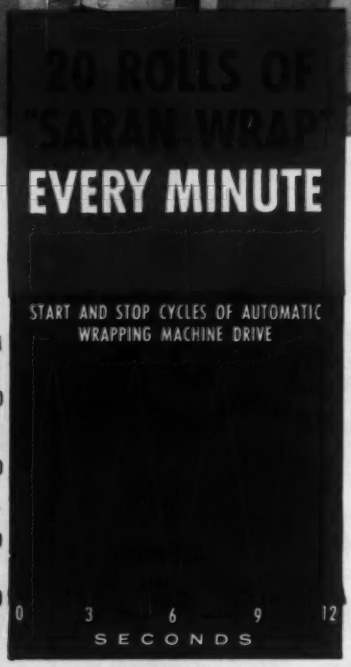

The Dow Chemical Company's production of "Saran Wrap" has leaped from 130,000 rolls to 4,000,000 rolls a month since 1951. This up-swing is due to a new plant, a new flow system, and additional equipment including new machinery equipped with Reliance V★S Drives.

One of the most dramatic applications of V★S Drives is on the final wrapping machines shown here. The drives must be able to start, accelerate to 3500 rpm., and stop more than 20 times a minute.

The most important feature, though, is not the frequent starts and stops, but the delicately controlled acceleration of the drives. "Saran Wrap" is only 1/6th as thick as a human hair, and sharp or jerky starts will cause a break in the sheet and halt production. Reliance Drives do the job day in and day out without a single break due to uncontrolled acceleration.

This feature of V★S Drives, called *Dynamic Response*, is only one of the many facets of Reliance Drives. V★S Drives can regulate tension, synchronize operations, control speed rates, and automatically program speed changes.

Whether you handle a thin film of plastic or steel billets, on a complete production line or a single machine, Reliance can give you better quality, more production, and lower costs through Variable Speed Drives. D-1508

Write for bulletin D-2311.

RELIANCE V★S DRIVE ®

RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES
Canadian Division: Welland, Ontario

P&H LOW-HYDROGEN ELECTRODES

Cut Rod Cost 80%

— free report shows how

If you have tough jobs that require high strength welds, stainless steel rods are NOT the only answer. In fact, you can save up to 80% of stainless steel rod costs, by using P&H low-hydrogen electrodes. In addition, P&H low-hydrogen electrodes meet rigid tests for use with problem steel.

In the complete, impartial report offered here, you will find that P&H low-hydrogen electrodes save you money in many ways. Yet they reduce weight and make better products. There's a lot more information in this report. Read about actual tests for production quality, quality control, impact tests, supervision, and many other operations.

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I'M SMOOTHARC SCOTTY... with news on money-saving welding methods used by a big company. Get this detailed, impartial report ... It's free!

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the P&H *Line*

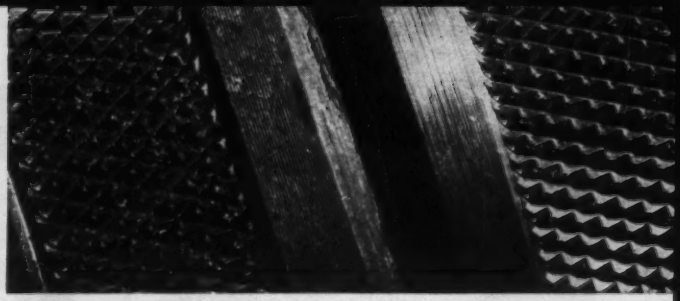
TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PREFABRICATED HOMES · HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

DIFFERENT COMPOSITIONS of G-E Neutralene gas are possible to fit various applications—annealing, hardening, brazing, sintering, and carburizing. G-E gas producers shown are rated at 15,000 CFH; complete line includes ratings from 200 CFH.

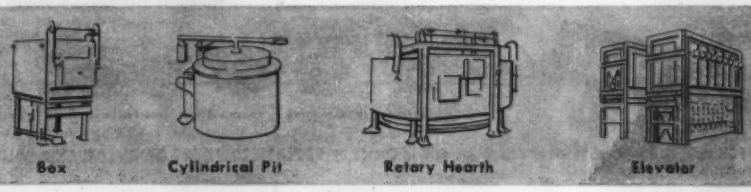
CAPSULE CASE HISTORIES SHOW BENEFITS OF USING PROTECTIVE ATMOSPHERES

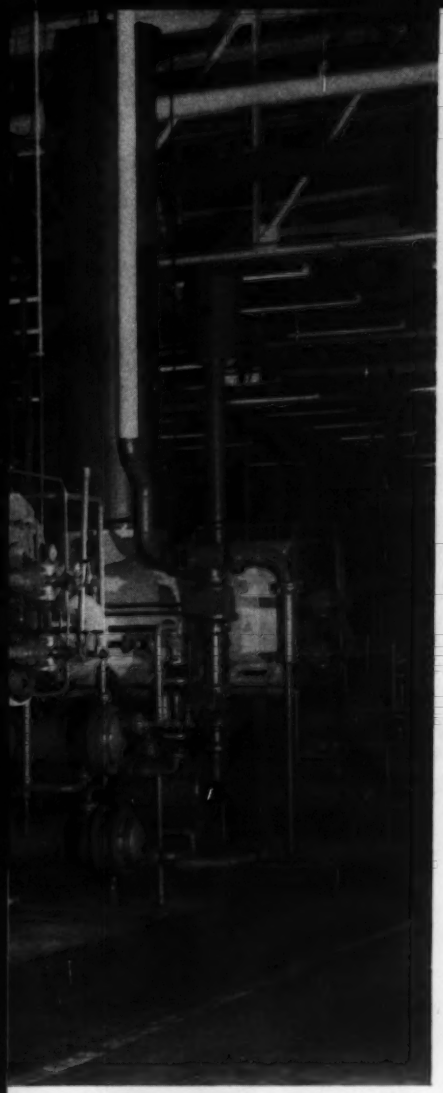
OXIDES REDUCED when parts are bright annealed in Exalene gas. Pan on left is shown before cleaning; center pan, after pickling only; pan on right, after bright annealing only. Exalene gas is used also in normalizing, hardening, brazing, and sintering.



SCALE-FREE UNPITTED drill chuck on right was hardened in Thermalene atmosphere, does not need subsequent cleaning; chuck on left was hardened in air. Thermalene gas is used also in bright annealing, normalizing, brazing, sintering, and carburizing.

GENERAL ELECTRIC SELLS A COMPLETE LINE OF INDUSTRIAL FURNACES





Eliminate Expensive After-work— Produce Clean Heat-treated Parts with G-E Protective Atmospheres

Protective atmospheres help you turn out heat-treated parts that are free from scale or oxides. They enable you to turn out a more salable product . . . at lower cost. This is true because pickling, grinding, machining, sandblasting, and similar operations are often made unnecessary.

General Electric offers various types and sizes of gas producers that let you manufacture atmospheres inexpensively—right in your own plant. You can prepare these atmospheres to provide exactly the right quality protection for your particular process. G-E protective atmospheres include: Exalene, an exothermic gas; Neutralene*, a CO_2-free, dry, exothermic gas; Thermalene*, an endothermic gas; Ammalene, dissociated ammonia.

Check these benefits of using protective atmospheres:

PREVENTING OXIDATION of metal surfaces during furnace heating is a primary advantage of protective atmospheres. Parts are produced at less cost and in a shorter total time cycle when scale formation is eliminated.

REDUCING OXIDES which have already formed is easily done by heating in a furnace supplied with the proper protective atmosphere. This reducing, or cleaning, is often used to prepare steel for porcelain enameling, galvanizing, or for furnace brazing.

CONTROLLING SURFACE COMPOSITION of metals in such operations as carburizing, nitriding, and prevention of decarburizing requires closely controlled furnace atmospheres.

ACCESSORY EQUIPMENT to meet specific needs is available:

Sulfur Removers take out sulfur dioxide and hydrogen sulfide where sulfur might harm the work or the furnace.

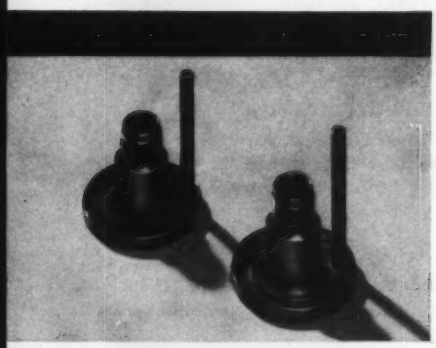
Regenerative-type Dryers remove moisture from gases. Can be had with closed-system reactivation for high-purity uses.

Refrigerated Gas Coolers remove some of the moisture from gases. These coolers may be used with regenerative-type dryers to reduce costs of preparing gases with low dew points.

COMPLETE SERVICES of your local G-E Apparatus Sales Representative include helping you to choose the most effective furnace atmosphere for your particular application . . . and to do it at lowest cost. Call him or send in coupon below for free descriptive bulletin.

*Reg. Trade-mark of General Electric Co.

GENERAL ELECTRIC



CLEANING ELIMINATED when stainless steel parts are brazed in Ammalene gas. Right-hand part is shown as it came from the brazing furnace—bright and clean.

FREE BULLETIN

Section A721-7
General Electric Company
Schenectady 5, N. Y.

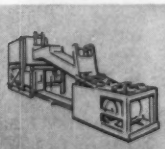
Please send me a copy of your bulletin, Protective Atmospheres, GEA-5907.

NAME.....

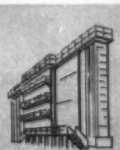
COMPANY.....

ADDRESS.....

CITY..... STATE.....

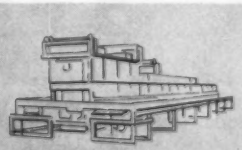


Mesh Belt

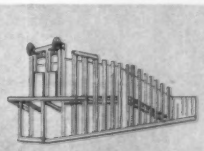


Tower

Cylindrical Belt



Roller Hearth



Continuous Conveyor

Five ways to combat the steel shortage

As a steel distributor we, too, are greatly affected by the current shortage of plates and structurals. We have noticed, however, that those steel consumers who do the following five things seldom fail to get their share of available steel.

1. USE WAREHOUSE STOCKS

Put the legitimate warehouses (steel distributors) in your area to work on your problem. They are close to mill sources—it is their business to have up-to-date information on steel supply.

2. CONSIDER SUBSTITUTES

Give these distributors an opportunity to offer you substitute sizes and grades. Most warehouses still have many tons of steel in stock in a wide variety of grades and sizes. The answer to your problem may be easier than you think.

3. USE THE BEST SOURCES

Divide your purchases of steel from warehouses among several legitimate concerns. Be sure at least one of these concerns is a large, national warehouse that can supply you with stock from other branches.

4. AVOID THE GREY MARKET

Stay out of the grey market if you possibly can. Every time you purchase steel at higher than market prices, you increase the incentive for sharp operators to divert steel from the normal channels of distribution.

5. MAKE A LIST

Keep your warehouse sources completely and currently informed of what you need. Don't just tell them you need "anything" in beams and plates—give them an exact list of the grades and sizes that you use and keep it up to date. This means extra work for you, but it can very well pay off to your advantage, for if your steel distributor knows exactly what you need, he will pick it up wherever and whenever he finds it available.

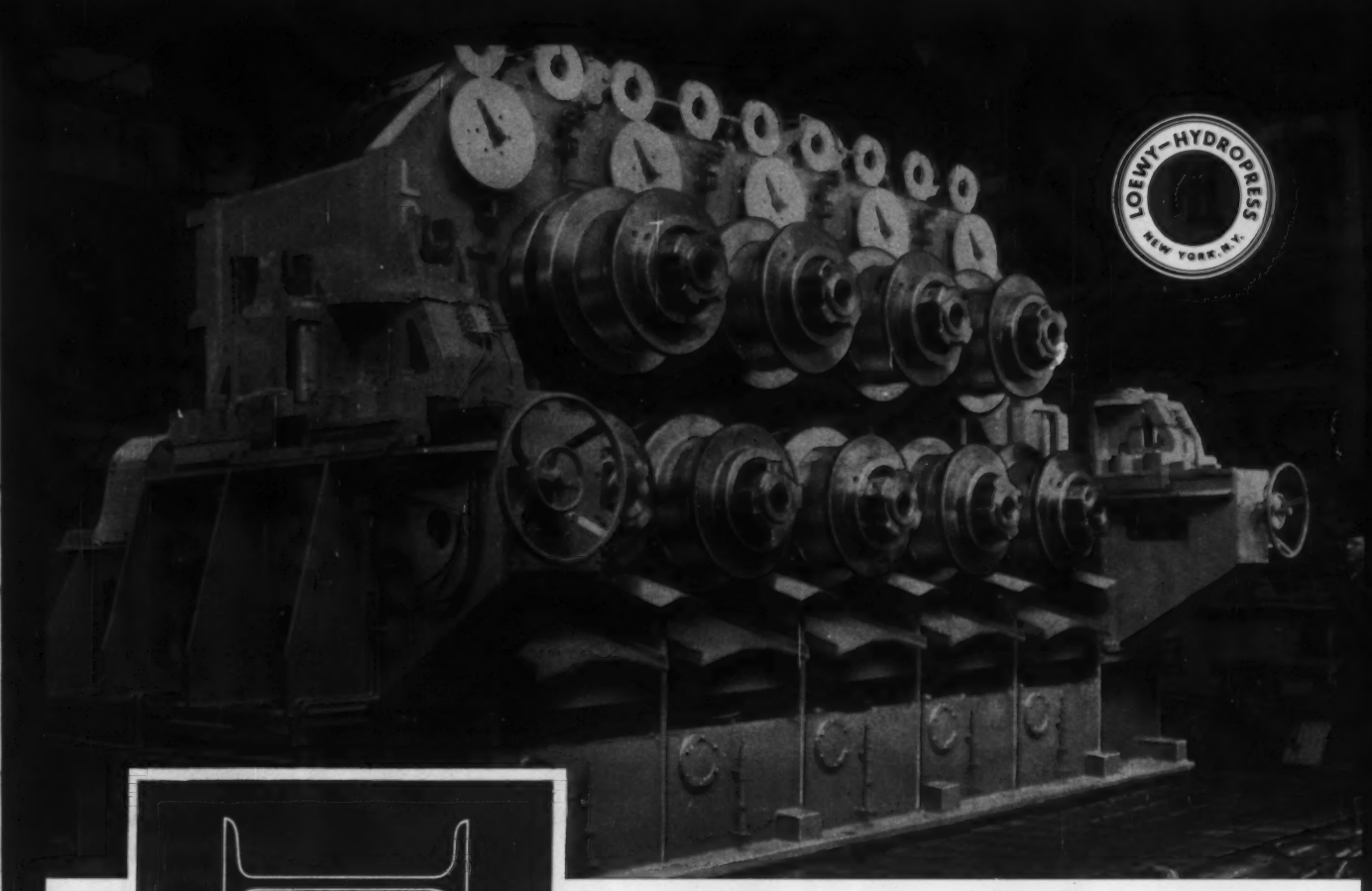
Here at U. S. Steel Supply, we stand ready to put a coast-to-coast and border-to-border steel service at your disposal. Call us to help you combat the steel shortage.

U. S. STEEL SUPPLY

DIVISION

General Offices: **208 So. La Salle St., Chicago 4, Ill.** **Warehouses and Sales Offices Coast to Coast**

UNITED STATES STEEL



new LOEWY roller straightener produces more tonnage to closer tolerances

Structural sections, sheet pilings, wide flange beams and heavy rails can be straightened to tolerances well above commercial standards with the new 1956 Loewy roller straightener. This efficient machine operates at speeds up to 500 FPM, and its production capacity is high, i.e. 20 lb. beams can be straightened at the rate of 1,320 tons per 8 hour shift and 73 lb. beams at the rate of 2,200 tons per 8 hours.

Other advantages you get with this new Loewy straightener are:

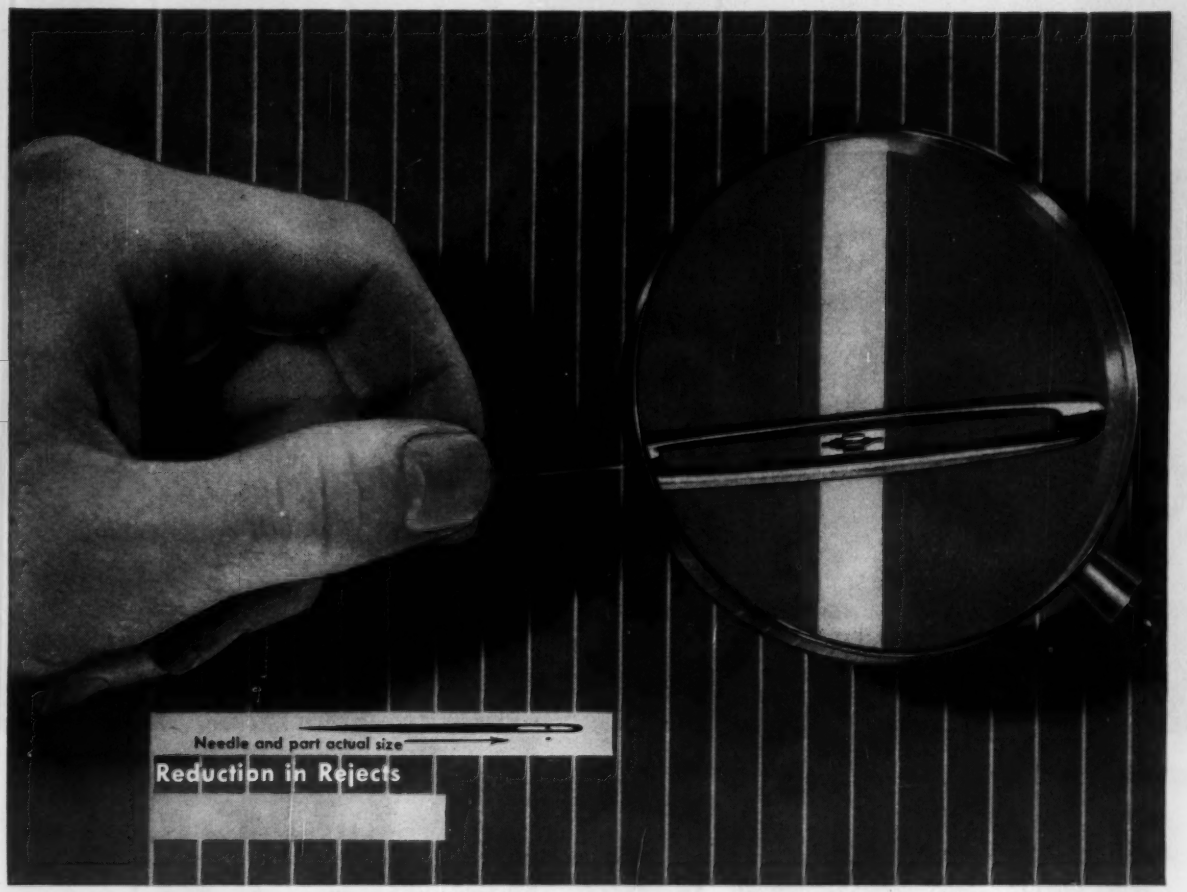
- **All welded rigid construction.**
- **Anti-friction bearings throughout.**
- **Motor driven, power operated vertical rollers supported on both sides in roller bearings.**
- **Remote control of vertical and horizontal roll adjustment, with accurate selsyn indicators mounted conveniently on pulpit.**
- **Quick roll changing.**

Loewy roller straighteners are in use in modern steel mills in the United States and abroad. The new model 1956 offers so many advantages over earlier designs that it is truly "*the design of tomorrow . . . today.*" For more information about this precision equipment, write to us at 046 Fifth Avenue, New York 1, N. Y.

BALDWIN · BLH · LIMA-HAMILTON

LOEWY-HYDROPRESS
BALDWIN-LIMA-HAMILTON

DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works



HOW FAR CAN YOU GO

in reducing rejects of critical parts?

Almost invisible to the naked eye, these tiny pinion pivots for small precision wrist watches easily fit into the eye of a small darning needle. *And they are mass produced on automatic screw machines!*

It's tough enough to work with such minute parts, but take a look at these really close tolerances: Over-all length is .0610″ with a tolerance of ± .0008″. End pins are .004″ round with a tolerance of + .00002″, — .00000″. The first steel used couldn't meet these strict specifications. Rejects ran too high.

Someone decided there must be a better steel for this job. And that's when Carpenter entered the picture. A specially-engineered Carpenter Steel was put to work. Result: fabrication improved and rejects were reduced 30%.

Why not discover how far you can go in improving your products and reducing costs? Carpenter has a wide range of quality steels for virtually any critical application, backed by one of the country's most alert service and warehousing organizations.

Begin now by sending for a copy of our 36-page booklet, "A Guide to Specialty Steels as Made by Carpenter." *The Carpenter Steel Co., 139 W. Bern St., Reading, Pa.*

Are you taking advantage of these specially-engineered steels as made by Carpenter?

Matched Tool and Die Steels / Stainless Steels / Special Purpose Alloy Steels / Silicon and High Nickel Alloys / Valve, Heat-Resisting and Super Alloy Steels / Tubing and Pipe / Fine Wire Specialties

Carpenter STEEL

for product improvement

Pangborn Rotoblast® cuts labor costs 33% at Commercial Steel Castings!

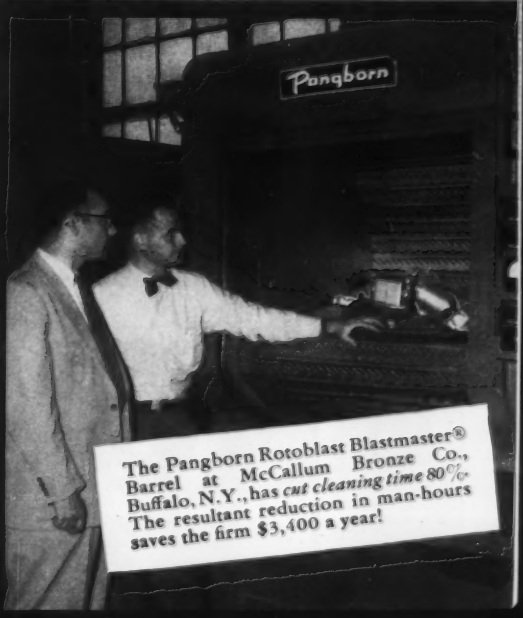
The Pangborn Rotoblast Room at Commercial Steel Castings Co., Marion, Ohio, has speeded production to the point where three round-the-clock shifts have been cut to two—a savings of 33% in labor costs alone!

You save on labor costs *two* ways when you blast clean with Pangborn Rotoblast. For one thing, Rotoblast's faster cleaning gives you more production per man-hour. This eliminates overtime, cuts down your work force . . . often permitting the reduction of two or even three shifts to just one.

In addition, the automatic operation of Pangborn Rotoblast frees your working men for other tasks during the actual blasting process. Lower labor costs, faster production, less maintenance, high-quality cleaning—these benefits mean *lower cost per ton of castings cleaned,* and make it well worth your while to investigate Pangborn Rotoblast for any blast cleaning problem. For complete details, write for Bulletin 227 to PANGBORN CORPORATION, 1600 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Visit "Pangborn Institute" at AFS SHOW, ATLANTIC CITY, May 3 to 9

And saves McCallum Bronze $3,400 a year in manpower!



The Pangborn Rotoblast Blastmaster® Barrel at McCallum Bronze Co., Buffalo, N.Y., has *cut cleaning time* 80%. The resultant reduction in man-hours saves the firm $3,400 a year!

Pangborn

BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

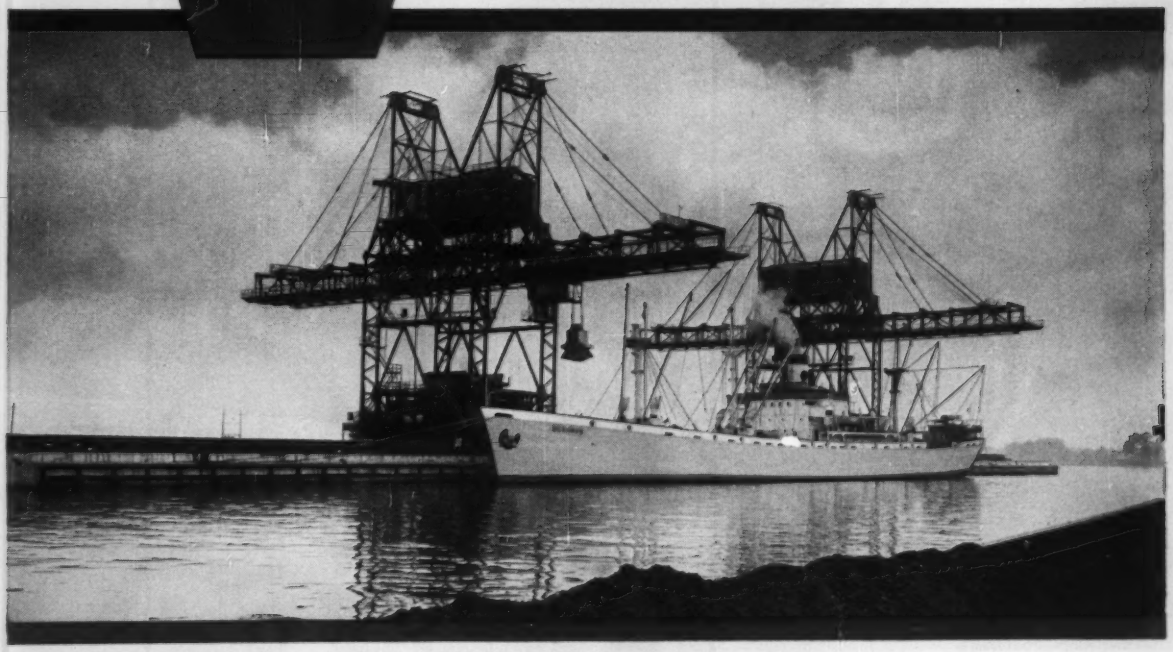
Rotoblast® Tables & Table-Rooms

Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Distributors for Malleabrasive and Tru-Steel Abrasives

new Pennsylvania R pier
handles up to 3600 tons
per hour with **BROWNHOIST**
ore unloaders



60 tons a minute! Seems incredible, but that's the production pace set by these two giant Industrial Brownhoist ore unloaders at the new Pennsylvania Railroad pier in Philadelphia, Pennsylvania. Towering over both pier and ocean-going ore vessels, the two enormous Brownhoist machines—each with a free-digging capacity of 1800 tons per hour—provide this ore terminal with the most modern and efficient unloading facilities in the United States. They can travel the full length of the pier and lower apron extensions from either side to obtain a reach of 72 feet from the dock. Each huge 25 ton capacity bucket rolls out, takes a bite, rolls back on the apron to drop its contents into a 100-ton receiving hopper, then rolls out for another bite. Time elapsed from bite to bite? *Just 45 seconds!*

The same engineering experience that made these Brownhoist ore bridges possible has also resulted in other fine Brownhoist materials handling equipment . . . locomotive cranes, wrecking cranes, car dumpers, traveling bridge cranes, buckets. If you have a heavy duty materials handling problem, it will pay you to discuss it with our engineers at Brownhoist.

BROWNHOIST MATERIALS HANDLING EQUIPMENT
GIVES A LIFT TO AMERICAN INDUSTRY

INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago, Denver, San Francisco, Montreal
AGENCIES: Detroit, Birmingham, Houston

SUBSIDIARY OF Penn-Texas

184

BROWNHOIST

WICKWIRE ROPE DISTRIBUTORS WEAR MANY HATS

Wickwire Rope distributors are men who wear many hats. They are at home in the headgear typical of the numerous and varied industries they serve—the marine and fishing trades, the oil fields, construction, logging and many other industries having specialized wire rope needs.

These men aren't hat models—they can wear these hats because of their long experience in the industries they serve. Add to this their intimate knowledge of local conditions and their comprehensive Wickwire Rope stocks, and you'll see that your Wickwire Rope distributor is the man who can be of great help to you.

Yes, your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and wire rope slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

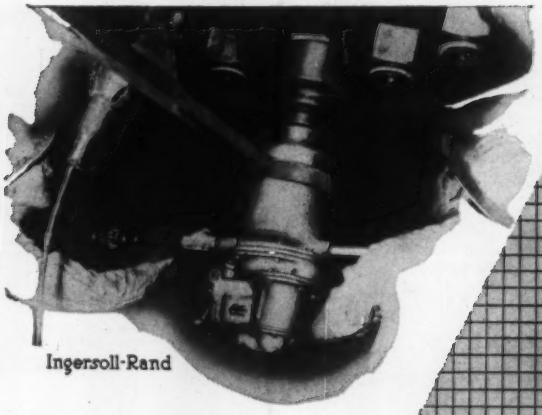
CF&I WICKWIRE ROPE A CF&I PRODUCT

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

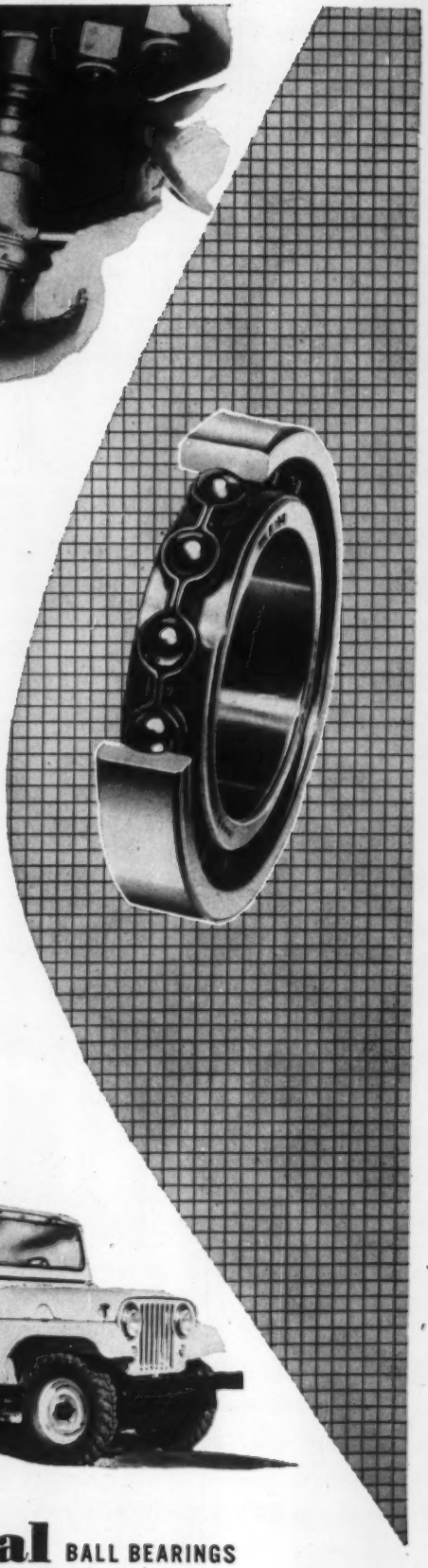
3154

Nuts and Bolts...

Tightening and removing 5" diameter nuts and 3¼" diameter bolts on a 115,000 HP Hydro-Generator! A rugged task, but this rugged Air Impactool is equal to it! And, like so many hard-working tools, it uses hard-working anti-friction bearings. Federal Ball Bearings, of course!



Ingersoll-Rand



so much of industry *turns* on FEDERAL ball bearings

On tough jobs or rough roads... in the machine shop, office or on the farm. Wherever anti-friction problems need to be solved—that's where you'll find Federal Ball Bearings at work. There are hundreds of types—12,000 sizes—and they're produced by a 50-year-old manufacturer of ball bearings *exclusively!*

When Federal Ball Bearings are part of so many things you *use*, shouldn't they be part of the things you *make*?

THE FEDERAL BEARINGS CO., INC. • POUGHKEEPSIE, N. Y.

Latest ball bearing and engineering data! Full 175 pages of it—in FEDERAL'S *NEW* CATALOG! Just speed us your request and we'll speed you back your copy!

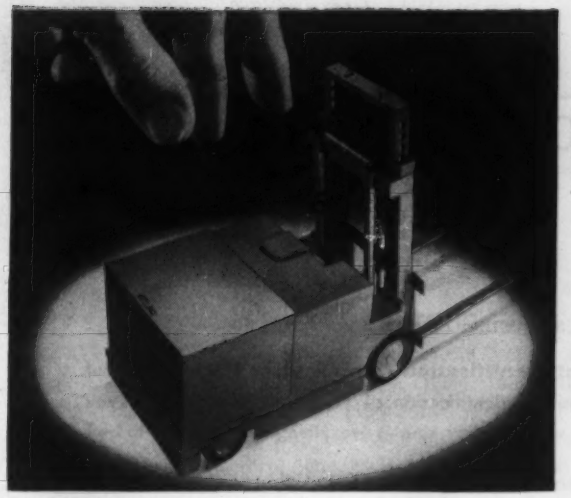
or Ruts and Jolts...

Our old friend the Jeep—new CJ model. As ever; daring, dependable, durable—on the road or off! It, too, is served by reliable Federal Ball Bearings—doing their anti-friction job in the gear transmission.

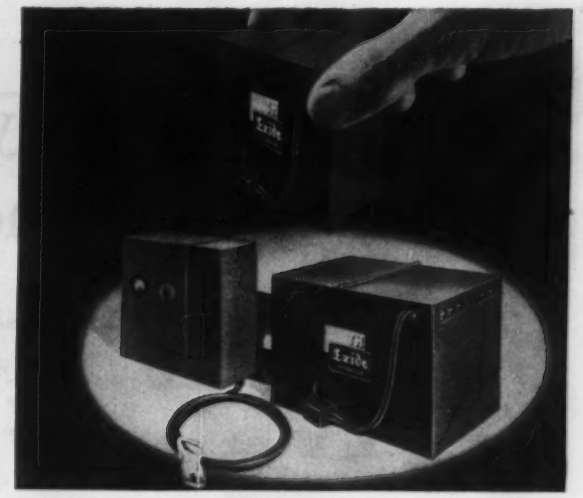
WILLYS

Federal BALL BEARINGS

One of America's Largest Ball Bearing Manufacturers

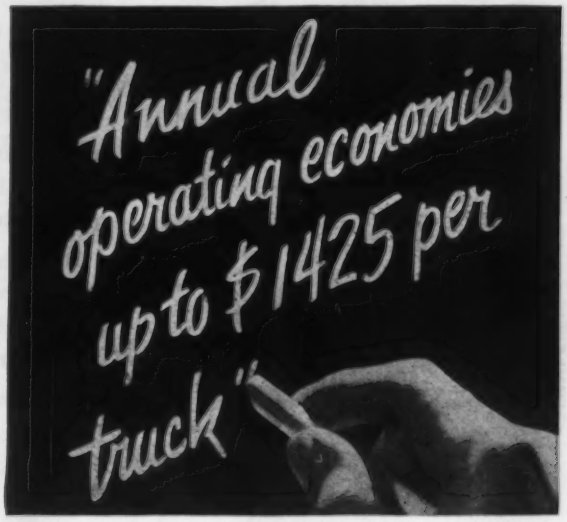


YOU BUY ONLY THE TRUCK CHASSIS. Choose any make of battery-powered electric industrial truck. Buy one truck or an entire fleet.



LEASE POWER PACKAGE FROM EXIDE. You receive famous Exide-Ironclad Batteries, plus the charger. Monthly cost is surprisingly low.

SAVE UP TO 33% CASH OUTLAY. This new Exide leasing plan brings initial cost for electric trucks down within range of trucks using any other kind of power.



PAY BATTERY LEASING COSTS OUT OF OPERATING ECONOMIES. Exide-powered electric trucks cost less to own and operate. Savings are tremendous!

SAVE UP TO 33% CASH OUTLAY ON ELECTRIC TRUCKS

New Exide leasing plan points the way to lower materials handling costs

Look how many ways Exide-powered electric industrial trucks can save you money just through operating economies: no wasted power when the truck is stopped; faster handling of materials; no unscheduled downtime; no high repair bills. *Added safety feature*—no bothersome fumes or noise. You pay for Exide power as you use it—the same as with other forms of power. But electric trucks give you over twice the operating life. Additional shifts multiply the economies.

Now you can have all these advantages at a new low initial investment—through the Exide leasing plan. And you get famous Exide-Ironclad heavy duty batteries with the unique positive plate. Electrolyte flows easily through slotted power tubes to reach more active material faster. Result: an Exide-Ironclad delivers more power quicker for a longer time at lower cost.

Get all the facts and figures on how the Exide leasing plan can meet your particular requirements. Call your Exide sales representative. Talk with any electric truck salesman. Send the coupon.

Exide

Send for complete details

Exide Industrial Division
The Electric Storage Battery Company
Phila. 2, Pa.

Send me details on the new plan for cutting cash outlay on electric trucks.

Name_____ Title_____
Company_____
Street_____
City_____ Zone_____ State_____

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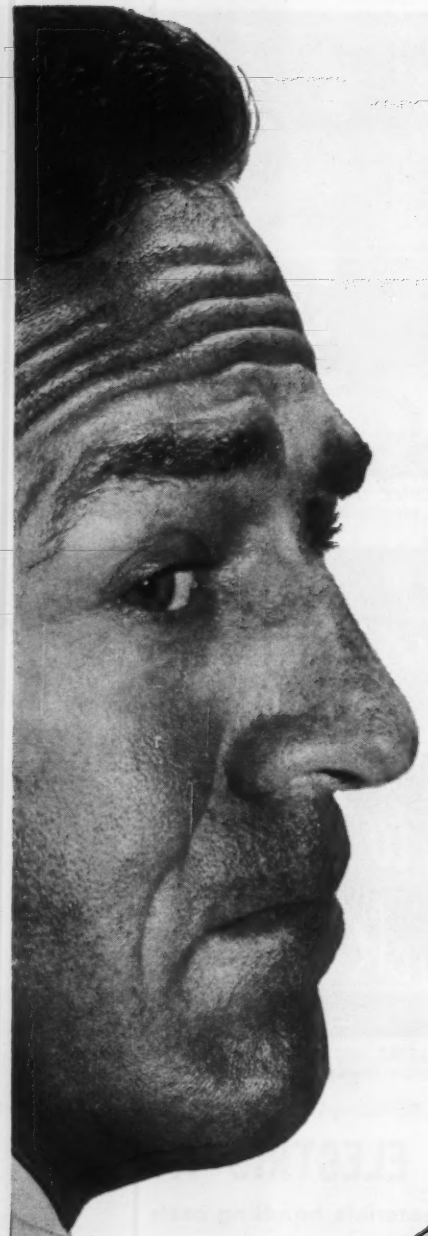


Do you really know the alloys you buy?

For instance, are you SURE of:

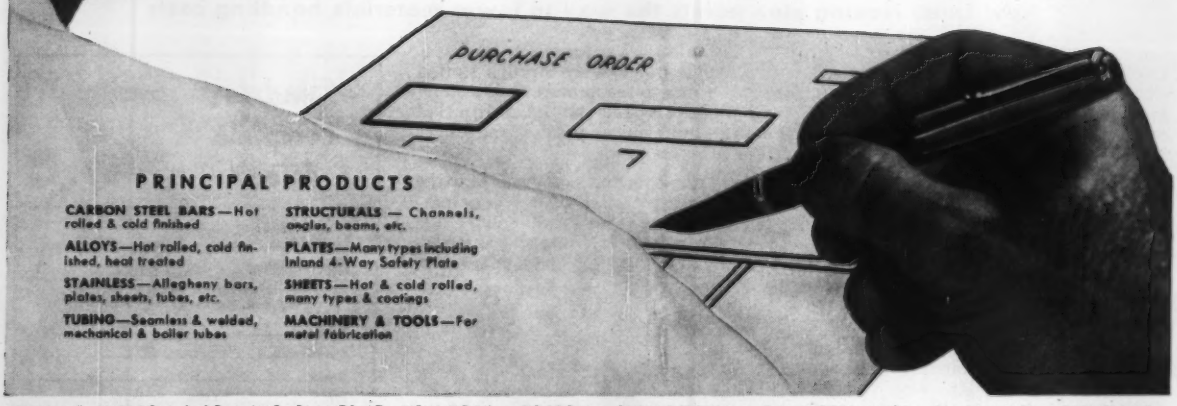
- **Heat identification** . . . not just type identification but the positive identification of your particular heat so you can be sure the alloy steel is everything it is supposed to be?
- **Chemical analysis** . . . not just the chemical range for the type, but the specific analysis of the heat from which your steel was rolled?
- **Hardenability** . . . not just the average hardenability for the type of alloy, but the actual test-proved hardenability of your particular heat of steel?

If you don't know these important facts, you may be in for trouble—loss of time and money; breakdown of equipment. It can happen when you're not sure of your alloys.

But when you work with Ryerson alloys you *can* be sure—sure of the steel you get, sure of what it will do—because Ryerson alloys are certified by an 8-step quality control program.

Every step has a specific purpose—every step is designed for your protection, but doesn't cost you a dime. For alloys with all questions answered, call your nearby Ryerson plant.

RYERSON STEEL



PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

TUBING—Seamless & welded, mechanical & boiler tubes

STRUCTURALS — Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot & cold rolled, many types & coatings

MACHINERY & TOOLS—For metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Metalworking Outlook

Prospects for Profit: Steel

Look for second quarter earnings in steel to match the excellent showing of the first three months. Here are some sample first-quarter earnings (the second figure is for 1955's first quarter): Republic—$25.0 million vs. $18.2 million; Jones & Laughlin—$13.6 million vs. $9.6 million; Allegheny Ludlum—$4.6 million vs. $2.4 million; Pittsburgh Steel—$2.5 million vs. $910,000; Alan Wood—$689,000 vs. $269,000.

Prospects for Profit: Metalworking

Second quarter profits for metalworking generally should also equal first quarter showings. Comparisons show that earnings in the first three months this year aren't markedly different from the same period in 1955, except in steel which was slow to get started last year. Net earnings for General Electric hit $55 million in the first quarter, compared with $52.5 million in 1955's first three months. General Motors' net profits in the first quarter were $283 million, compared with $309 million in the same 1955 period.

Steady Output

You can expect level industrial production through the second quarter. The Federal Reserve Board's seasonally adjusted industrial production index dipped to 142 per cent of the 1947-1949 average in March from 143 per cent in February. The index should stay between 140 and 145 during April, May and June.

Reversal in Youngstown

Youngstown Sheet & Tube Co. is considering spending another $15 million or $20 million on expansion in the Youngstown area, in addition to the $40 million already earmarked for the region. President J. L. Mauthe says the Mahoning Valley's prospects as a steel center have been reversed within the last three years. GM's move to build a Chevrolet assembly plant near Warren, O., plus other expansions in northern Ohio, accounts for the reversal.

Sour Notes?

Sounding a discordant note in metalworking's song of expansion are scattered announcements and threats of plant closures. J. I. Case Co. will close down a farm implement factory at Racine, Wis. The union at Philco Corp.'s Philadelphia plant is taking seriously management's disclosure that the company will have to leave Philadelphia unless employees

Technical Outlook—p. 115 Market Outlook—p. 163

accept more mechanization, cut down on absenteeism and improve their quality and productivity.

Power Aplenty

The nation's electric power industry may be called on for a 123 per cent increase in output in the next ten years. GE's Ralph J. Cordiner expects the nation's power consumption in 1966 to reach 1.5 trillion kw-hr, compared with an estimated 680 billion for 1956 and 307 billion in 1947.

GM Notes

An anticipated increase in steel prices may be reflected in the price of GM's 1957 products . . . The corporation's 1957 car models will be announced about Nov. 1, "plus or minus ten days" . . . Unit sales of GM cars and trucks from U.S. plants in the first quarter totaled 1,094,000 vehicles, less than 0.5 per cent below the record 1955 first quarter . . . Defense deliveries in the first quarter dropped to 4 per cent of total dollar sales from 9 per cent a year ago.

SUB: No Vote of Confidence

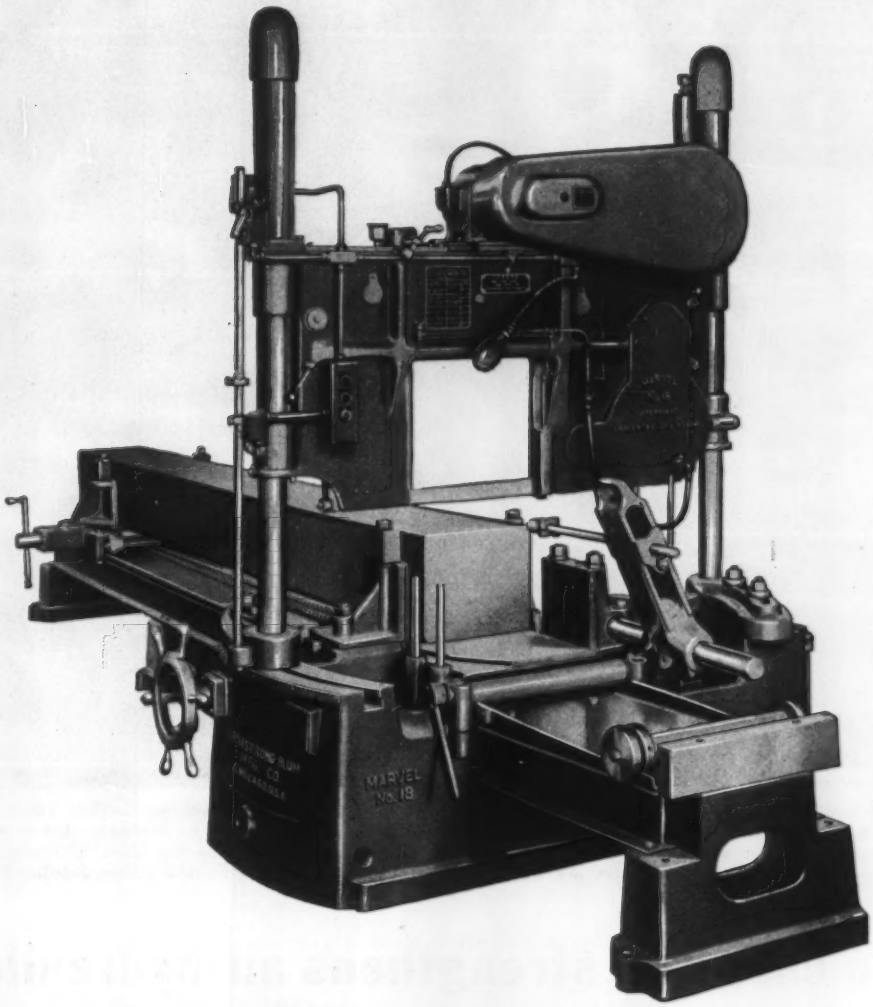
Supplemental Unemployment Benefit plans haven't captivated the minds of most labor leaders. National Industrial Conference Board surveyed 51 U.S. labor leaders, representing unions with nearly 7 million claimed members. The union chiefs prefer more liberalized state unemployment compensation, severance pay plans and a shorter workweek. Given a choice between an insurance-type plan (such as Ford's) and one based on individual accounts (like the glass industry's), union leaders generally preferred the Ford type.

Experiment in Transportation

Keep your eye on an experiment in transportation being tried by Pittsburgh Consolidation Coal Co. and Cleveland Electric Illuminating Co. A 108-mile pipe line will carry coal slurry from Georgetown, O., to Eastlake, O. The $12-million installation, including a pumping station, two boosters along the line and drying equipment at Eastlake, will be ready early next year. CEI expects to receive 3400 tons of coal a day via the line, at a cost 50 per cent cheaper than via rail. The two companies, which have signed a 15-year contract involving more than 18 million tons of coal, think this could be the first link in a national network serving principal consuming areas.

Straws in the Wind

General Electric will enter the color television receiver market in the last half; it has also just cut prices on five types of transistors, the third reduction in 14 months . . . Foote Mineral Co. offers lithium metal in commercial quantities from an Exton, Pa., plant . . . A nationwide Operation Alert for industrial plants is scheduled for July 20-26 to brush up on defenses against atomic attack . . . For the second quarter, export licenses will be approved for only 4000 tons of aluminum scrap, compared with 6000 tons in the first quarter . . . Until further notice, copper-nickel alloy scrap export licenses generally won't be approved.



No Job too big or too tough . . .

for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18" x 18"; and No. 24, Capacity 24" x 24") were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

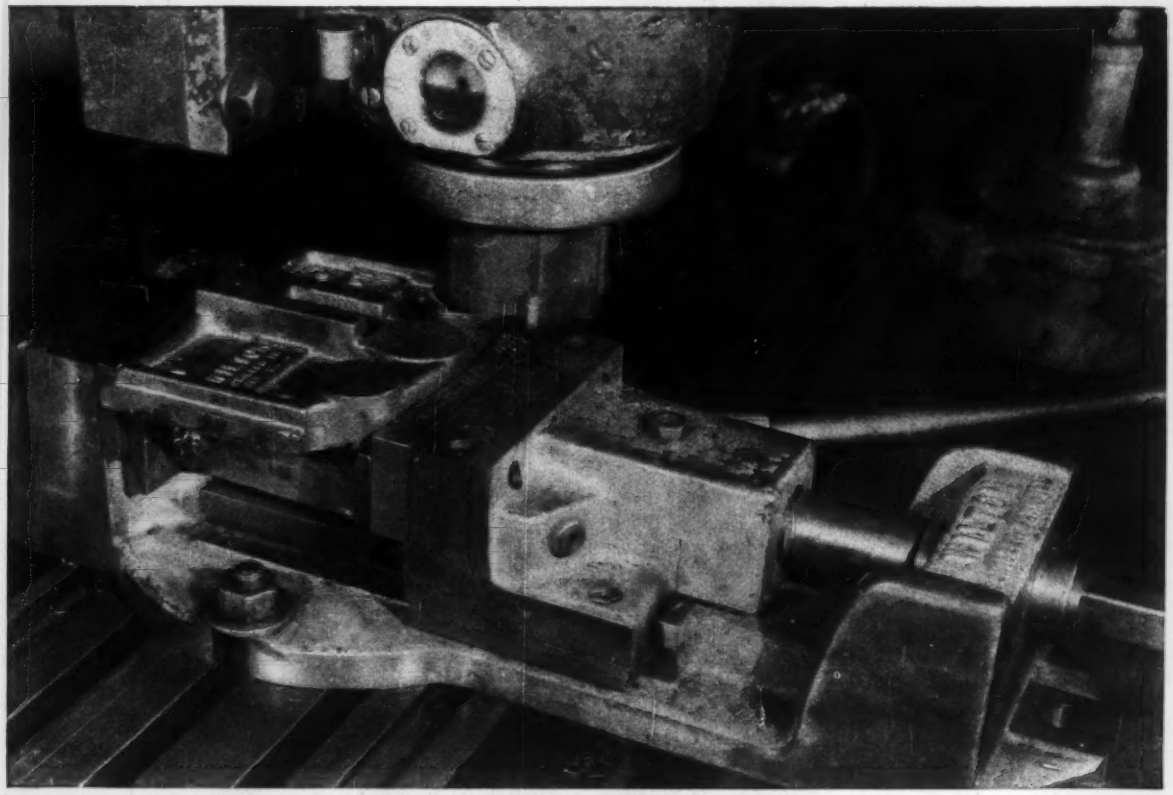
In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

Write for Catalog

Metal Cutting MARVEL SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.



Strength and Toughness of ductile cast iron parts permit compactness in Wilton's Milomatic vise. This air-powered hydraulic unit brings new concept in production tooling because inexpensive jaw adapters make it a fully automatic production fixture. Users shift it from one job to another, saving substantial investment and tooling time. Built by Wilton Tool Manufacturing Company, Inc., Schiller Park, Ill.

Ductile cast iron strengthens air-hydraulic vise with tremendous locking force

Combining hydraulic force and compressed air power, this compact vise speeds machine loading.

It gives users split-second action and a 9,000-pound locking force. Safely, because jaws and all other castings in the unit are of ductile cast iron.

A great advance

Ductile cast iron is the greatest advance in foundry products in more than a century. As cast, this tough iron provides up to 110,000 psi tensile strength. And up to 210,000 psi when heat-treated. Moreover, its elastic modulus is about 24,000,000 psi, approaching that of steel.

Mechanical properties of ductile cast iron approach those of steel. In addition, ductile cast iron offers the machinability and wear resistance as well as the fluidity and castability of cast iron.

Replaces more costly materials

On hundreds of jobs, ductile cast iron performs better than more costly materials. It also cuts production costs in many fields because it behaves better in the shop. So consider how you, too, can improve your products or output with ductile cast iron. And save money at the same time.

Get all the facts about this economical iron. It is several times stronger than gray cast iron. And up to 12 times tougher. *Send for a copy of* "DUCTILE IRON, *The Cast Iron That Can Be Bent!" Write for your copy now.*

DUCTILE IRON **ductile iron . . . the cast iron that can be twisted and bent**

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street, New York 5, N. Y.

Ideas for Free!

One of your organization's richest assets is the ideas wrapped up in the minds of your associates and employees.

Too often they lie untapped because of the importance attached to being "right." We hold back for fear that we will be ridiculed; that our idea will be labeled "silly"; that we will be told that it has been tried before.

How can we mine this wealth of creative thinking?

Brainstorming, one of the techniques being used successfully in industry, is presented by the editors in this issue of STEEL (Ideas for Industry, page 105).

Its theory is simple: Many people do not think up and speak up in a conference because of the fear of criticism.

Brainstorming outlaws evaluation and adjudication while creative thinking is in progress. Inhibitions are let down. The object is to get ideas in quantity. "Quality" is judged later by another group.

A brainstorming session goes like this:

A small group of people of about the same status gathers around a table in a meeting room. A secretary or a tape recorder (preferably both) stands ready to collect the ideas.

Ground rules are stated by the moderator: Only positive, creative thinking is permitted. Criticism and evaluation are out.

The moderator states the problem, which is reduced to a simple, specific question.

To get the session going, the moderator usually contributes the first idea, a ridiculous one to assure participants that "free thinking" is in order.

Then the ideas start popping, one touching off another.

Results are amazing to those trying the technique for the first time. In 15 minutes you can harvest more good ideas in a brainstorming session than you can in a boring, day-long conference of the conventional sort.

Brainstorming can be used in solving technical, production, sales and marketing problems. It has saved thousands of dollars for metalworking companies like your own. It has licked problems that defied solution.

If you haven't tried it, we think you should. The ideas are there—and they're for free!

Irwin H. Such

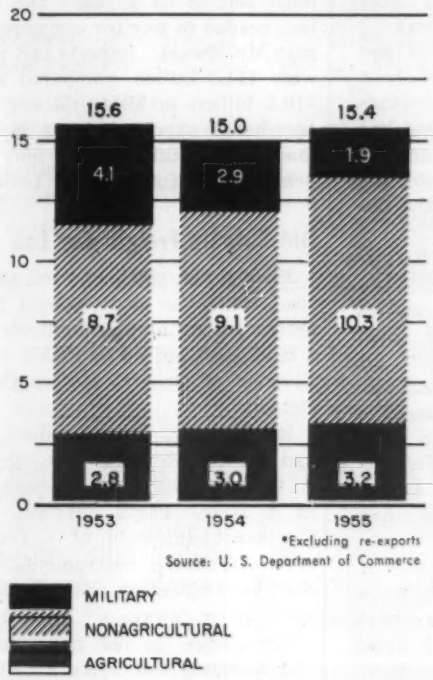
EDITOR-IN-CHIEF

WHEN THE BACK NEEDED A BREAK

Time was, and not too long ago, when industry used to spend almost as much time moving products as in making them. Then right before our eyes a whole new industry evolved, dedicated to the efficient, mechanized handling of materials. Today, the wizardry of materials handling people has not only sliced substantial cost items from industry's expense sheets, but has won the eternal gratitude of working men everywhere. Better steels have contributed to the developments in materials handling. And at Inland, we've been giving progress a push by providing the *right* steels to this important industry.

INLAND STEEL COMPANY *38 South Dearborn Street, Chicago 3, Illinois. Sales Offices: Chicago, Milwaukee, St. Paul, Davenport, St. Louis, Kansas City, Detroit, Indianapolis, New York. Steel products supplied to the materials handling industry include sheets and strip, Ti-Co galvanized sheets, bars, plates, structurals, 4-Way safety plate. Other products: tin mill products, reinforcing bars, rails and track accessories, coal chemicals.*

U. S. Exports*
(billions of dollars)



Metalworking Exports
(millions of dollars)

	1953	1954	1955
Passenger autos	276	301	381
Trucks & busses	264	333	342
Auto parts & accessories	423	402	511
Machine tools, metalworking machinery	278	210	206
Other industrial machinery	775	807	884
Iron and steel mill products	495	516	815
Electrical machinery & apparatus	646	599	639
Construction & mining machinery	492	448	535
Metal manufactures	343	341	397
Nonferrous metals & ferroalloys	176	305	317
Tractors, parts & accessories	300	278	286
Agricultural machinery & implements	138	126	123
Total metalworking exports*	4606	4666	5436

*Excluding exports to which security restrictions apply

U. S. Competes Abroad

With improved credit policies, American firms are selling more capital goods overseas. Consumer products continue to find rough sailing, however

U. S. METALWORKING exports in 1956 should exceed the dollar volume in 1955, but the export picture is not without complications. Biggest problems: Increasing foreign competition, poor American sales techniques abroad, the possibility of a limited war.

Last year, more American goods were sold abroad than in any other except 1947 (excluding military goods). Nonagricultural exports showed the largest increase, and metalworking accounted for a healthy chunk of that (see tables). Military shipments have declined more than 50 per cent since 1953.

Prospects—Machinery shipments last year were up about 8.5 per cent from 1954's. "The outlook this year for machine tools and construction machinery is good," says one trader. Reports R. W. Gresham Jr. of A. W. Fenton Co. Inc., Cleveland: "All my clients are hopeful about exports."

The export director of an automotive and aircraft part producer believes U. S. exports in direct competition with British, German and Japanese products are not selling as well as in past years. "We'll be lucky to match our 1955 volume," he says. This firm is constantly seeking new export products which do not have to face direct competition.

Some areas are almost closed to American business. One construction executive says his firm doesn't even bother to bid any more on projects like steam power plants. Turbogenerators are cheaper, and delivery is better, from Germany and Belgium.

Competition—Russia is making its weight felt today around the world with bids on hydroelectric dams, steel plants, and irrigation projects. Italian firms are becoming more important in South America, especially Brazil and Argentina. In Europe, Americans

are being tested by increased German competition.

The establishment of a German bank, patterned after the U. S. Export-Import Bank for the long-term financing of German exports, has been proposed by the Federation of German Industries. About 50 per cent of Germany's exports are capital goods for which long-term financing is necessary. U. S. capital goods compose about 25 per cent of our nonmilitary exports.

Credit Policies—Many exporters believe our overseas business is being held back by a cash-on-the-barrelhead policy, which has been outdated by the easy credit offered by Britain, Germany and others. This particularly applies to sales of consumer goods. Where German firms grant 180 days to pay for small, fast-moving consumer items, American firms require cash.

With capital goods sales Americans are in a better position, although some traders say not good enough. The Ex-Im Bank loans money primarily for projects which will contribute to the development of a foreign country. These loans are rarely for less than a year, the area in which U. S. firms say they need help.

Private Money — "They just haven't got the money in South America to do business on a cash basis," states one exporter. Paul Dietz, export department manager, industries group, Allis-Chalmers Mfg. Co., says: "In part at least the precipitousness of the decline in U. S. machinery exports between 1952 and 1954 can be attributed to the extended term financing our competitors brought to bear."

The outlook for intermediate term credits is better now with the formation of the American Overseas Finance Corp., which is owned by five U. S. commercial banks. Organized last year, it will finance export sales of capital goods and allied equipment for periods of one to five years.

Other aid to U. S. exporters is in the form of government insurance of capital investments abroad, and the Ex-Im Bank requirement that machinery for its projects must come from the U. S.

Restrictions—While the recent Egyptian action to limit imports from the U. S. isn't indicative of any trend, it does show the kind of thing that keeps U. S. exports down: Egypt has temporarily suspended the import of autos, refrigerators, washing machines, cooking stoves and heaters. In 1955, Brazil cut its imports from the U. S. by about 50 per cent.

Many American companies are traditionally unenthusiastic about exports, regarding them as a windfall after the domestic market has been taken care of. Firms are unusual that allocate production for export sales regardless of the domestic situation.

A Crutch—Says Charles Ewald, head of the Cleveland World Trade Association: "The U. S. uses its exports as a crutch to grab when domestic business gets sick." An exporter adds: "If a limited war of any kind comes along, and the sellers' market comes back, then our exports will drop off. Our attitude seems to be: Why worry about this foreign business when we don't have to."

This year, however, because of keener domestic competition, more American firms are serious about their export business. Such firms are taking a long look at their sales techniques abroad with the knowledge that the British, German, Italian and Japanese sometimes outsell us. Only a few American firms have full-time salesmen abroad. Usually one man will sell several lines, in the manner that a manufacturer's representative operates in this country.

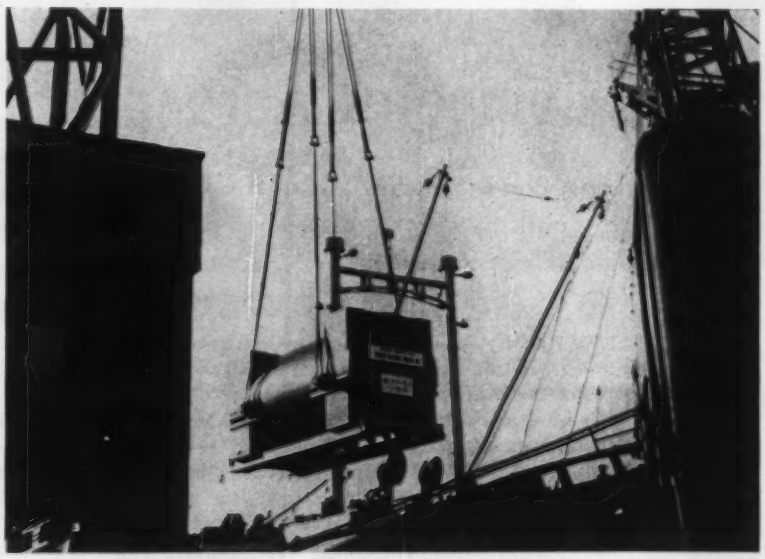
Imports — Foreign countries must sell to us to earn the dollars needed to pay for our exports, says Mr. Ewald. Imports last year were $11.3 billion, compared with $10.2 billion in 1954. If the import-before-export formula is followed, our future exports may depend on our future tariff policies.

GM Sets Up Freight Car Lab

Each shake, rattle and roll a railroad car takes as it cannon balls across the country is duplicated in a laboratory set up by Fisher Body Division of General Motors Corp., Detroit.

Roofs, quarter panels, deck lids and other components are subjected to the rigors of a 1000-mile trip in 1 hour. Parts are put into the exact duplicate of a freight car. Electronic instruments record every vibration upward, downward and sideways.

Knowledge gained helps material handling engineers at Fisher Body design and build loading and packaging aids that assure safer passage of components.



Juice for Japan

The heaviest single item ever shipped from New York in peacetime, this 185-ton generator stator is the heart of a turbine-generator unit for Japan's Chiba power station. Built by General Electric Co., it will supply the yearly power needs of nearly 925,000 people

U. S. Metalworking Exports to Canada

(millions of dollars)

	1955	1954	1953	1952	1951
Iron, Steel And Products	$1,432	$1,143	$1,324	$1,230	$1,146
Nonferrous Metals And Products	289	261	261	198	192
Miscellaneous Metalworking Products	204	178	201	172	99
Total	$1,925	$1,582	$1,786	$1,600	$1,437

Canada: Star Customer

Metalworking products lead growth of exports to our biggest single customer. Production economics strengthen the bet that "Buy American" trend will increase

CANADA, No. 1 export market for the U. S., will become an even richer market as a result of the Dominion's fast-moving industrialization and development program. Canada's annual per capita capital spending is double that of the U. S.

The bulk of the things Canada buys in this country are metalworking products. Last year we shipped nearly $2 billion in metalworking products across the northern border. That was 55 per cent of total exports to Canada.

Machinery Leads—Machines and equipment are our most important exports, although Canadian manufacturers are buying as much finished iron and steel products as they can obtain. The high demand in the U. S. prevents Canadian metalworking companies from obtaining as much sheet, strip, bars, plates, shapes and other forms of steel as they ask for.

Three - to - One—Canada buys three pieces of metalworking equipment for each piece it manufactures. Last year it purchased $39 million dollars worth of such machines from this country's manufacturers, according to the Dominion Bureau of Statistics, Ottawa. American machine tool builders say 21 per cent of their exports went to Canada in 1955, and plans are being made to increase shipments over the next few years.

Stake in Oil—Well drilling equipment valued at $44 million moved across the border to aid the development of the western oil fields.

Logging equipment valued at $14 million and paper-working machinery worth $10 million were bought in this country to help the Dominion develop its largest export industry—wood products and paper.

Detroit Customer—Canada still looks to the U. S. for much of its transportation needs. More parts than assembled vehicles are imported: Auto parts valued at $224 million went to Canada last year, compared with only $59 million in complete automobiles. Majority of cars used in Canada are assembled in that country, but many of the parts are made in the U. S.

Tractor and tractor parts account for $111 million in exports, mostly to the prairie provinces.

Supplement—Most Canadian industrialists and top government economists believe the U. S. will sell increasingly large quantities of machinery and equipment in Canada for decades to come. They say Canada's production runs are too short to enable effective competition with American mass production. It follows, they say, that Canada should concentrate on resource development with equipment built south of the border.

Canadian machinery people say that machine tool building in the Dominion is on the wane and that several equipment builders have withdrawn from the field. They would rather buy American and turn their efforts toward production of other products.

Nationalism — The Canadian-in-the-street does not share the opinion of the industrialists and government economists. He cannot understand why Canada should not manufacture and export finished products. He fears Canada is exporting too much of its resources and somehow is getting the small end of the deal.

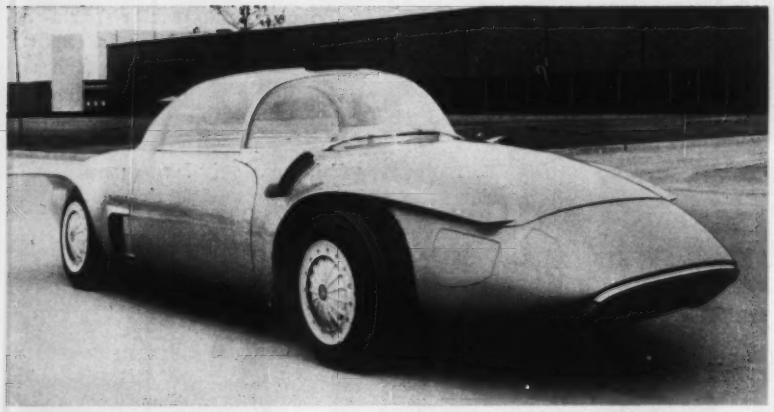
Canada Boosts Steel Exports

Despite the strength of domestic demand for steel last year, Canada's primary iron and steel imports were up just 27,444 tons from 1954's. Her exports jumped from 260,000 to 707,000 tons.

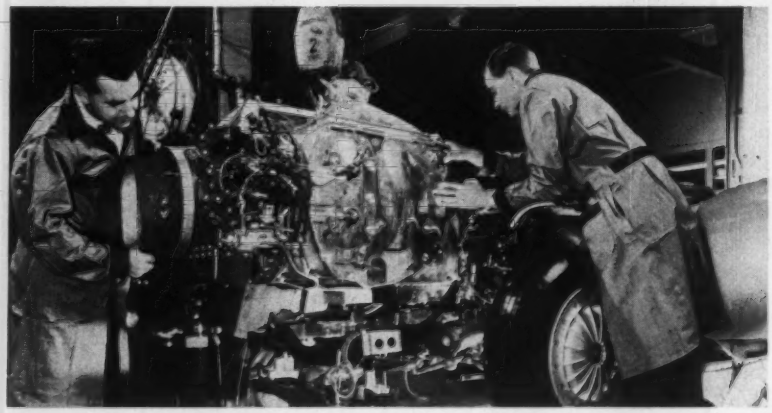
Most of her steel imports came from the U. S., which shipped in some 864,000 tons, compared with 300,000 from all other countries. U. S. exports to Canada were up 41,000 tons from 1954 figures.

Fast Tax Write-Offs O.K.'d

The Office of Defense Mobilization issued certificates of necessity for fast tax write-offs amounting to $270,682,669 from Mar. 22 to Apr. 4. Metalworking projects of $1 million or more included: Seven electric power transmission and generating facilities; four orders for railroad diesel locomotives; three orders for military aircraft, parts and engines; and one oil pipe line.



New experimental free-piston engine powers GM's XP-500. It burns almost all fuels. Exhaust gases are pumped back to a turbine driving the rear wheels



The latest "conventional" GM gas turbine engine with heat regenerator. It is installed in the Firebird II, and is being road tested for fuel consumption

Dream Car Economics

THE JOB of developing a gas turbine engine for mass production has been causing severe headaches in Detroit.

Heat regenerators are helping to slake the turbine's tremendous thirst for fuel, but ways must be found to lower operating temperatures to permit the use of cheaper, noncritical alloys. General Motors Corp. says its present turbine uses 75 lb of nickel.

Candidate — GM, though going ahead full steam with true turbine work, has announced a new contender in the race for tomorrow's power plant. It's the free-piston engine installed in the corporation's latest dream car (see upper photo).

If the gas turbine engine still isn't ready when standard engines lose their sales appeal, Alfred L. Boegehold, manager of GM's research staff facilities, believes the free-piston may be used to fill in.

Design—In effect, the free-piston engine is merely a means of keeping extremes of combustion heat outside the turbine. It operates, says GM, "like a bicycle tire pump or an old-fashioned fireplace bellows." A turbine is still needed to turn exhaust gases into usable power. In the XP-500, the engine is up front, the turbine in back. The two are connected by a pipe that carries the gases.

Results are that turbine operating temperatures are kept below 900° F, opening the door to the development of noncritical blade alloys. The free-piston design has other advantages. Experimental models have run on whale oil, peanut and other vegetable oils, as well as all types of mineral oils. Conventional transmissions can be discarded. The engine has good inherent balance and few wear parts. In the XP-500, the engine is rated at a nominal 250 hp.

When will we see gas turbine or free piston engines on the road? Harlow H. Curtice, GM president, thinks commercial production is still five to ten years away.

Predictions—Mr. Boegehold has some other ideas on what you can expect in tomorrow's cars. Speaking before a meeting of the American Society for Testing Materials, Cleveland, he said there will be a design premium on lightness and efficiency, though not at the expense of roominess. He forecast expanded use of light metals like aluminum and magnesium.

Predicting that the U. S. will have close to 88 million vehicles by 1980, he said: "If each car weighed only half as much, the fuel needed to move it along would be considerably decreased. Lighter construction materials must be used, and power plants which have the lowest weight per horsepower are needed. Engine efficiency must be further increased to cut fuel consumption."

Aluminum V-8 Engine Coming

Design work on a diecast V-8 auto engine block made of aluminum has been going on for several months at Doehler-Jarvis Division, National Lead Co., reports Alfred F. Bauer, division chief engineer and assistant general manager. He predicted the new block will weigh between 50 and 70 lb. The division has already diecast 6-cylinder engine blocks with aluminum (STEEL, Dec. 12, 1955, p. 61).

Road Machines Hit Pay Dirt

Equipment producers are completing a five-year, $200-million expansion. The federal highway program is a sure bet to spark another round

SALES PROSPECTS for construction equipment builders are among the best in history.

Says Caterpillar Tractor Co., Peoria, Ill.: "Our outlook is good." The company's target is $600 million, compared with $524 million in 1955. Caterpillar is already roughing in new expansion moves. By 1960, it plans to put out $190 million for additional capacity.

Take a look at the future with some other leading companies:

International Harvester Co., Industrial Power Division: "Our first quarter, which began last November, was 45 per cent above the same quarter of 1955. Barring steel strikes and such complications, we should end the year about the same percentage ahead of 1955."

Barber-Greene Co., Aurora, Ill.: "Sales in 1956 far exceed previous records. If continued at the present rate, we would exceed 1955 sales by at least 20 per cent. The increase could be appreciably greater if production were able to keep up with demand; already, deliveries on certain types of paving equipment extend far into the construction season."

Oliver Corp., Cleveland: "Sales at the moment are 35 per cent better than 1955's; this should be our best year."

Euclid Division, General Motors Corp.: "Our two Cleveland plants are working at capacity."

Koehring Co., Milwaukee: "Our 1956 sales will probably be about 30 per cent above 1955 levels; that was our best year to date."

Clark Equipment Co., Construction Machinery Division, Benton Harbor, Mich.: "Sales volume is expected to be some 75 per cent better than 1955's."

Marion Power Shovel Co., Marion, O.: "It is anticipated that our 1956 sales should exceed 1955's by at least 20 per cent."

Harnischfeger Corp., Milwaukee: "1956 sales are expected to be as high or higher than those of last year. They could exceed previously attained maximum sales, excluding military war requirements."

Baldwin - Lima - Hamilton, Construction Equipment Division, Lima, O.: "Orders in the first three months of 1956 indicate sales will be up considerably."

Embarrassing—Plaguing the industry, though, is continued tightness in steel and some components, plus problems involved with the recruiting of skilled machinists and engineers.

Says one producer: "Steel is a day-to-day, week-to-week proposition; a strike would to all intents and purposes put us out of business. We're going to all sources to get plate—and paying a terrific premium for it, too. But what are you going to do? Quotas are based on experience, and when you're expanding like we are, records mean little."

Growing—Engineering trends are to more horsepower and getting rid of the clutch. Sizewise, the bigger the machine the better seems to be the style, though new models in medium sizes are going well.

Reasons for the industry's optimism:

1. The over-all strength of the economy and of construction in particular.

2. Stepped-up federal aid to highways, prospects for which look better each week.

3. Construction, other than road, that would be generated by the highway program: Even before the New York Thruway was completed, some $150 million worth of new plants (employing 30,000 workers and with an annual payroll exceeding $100 million) had been built adjacent to it.

4. The need of contractors for new, more efficient machinery to keep down costs.

5. The export market: Caterpillar officials think the export market has hardly been scratched. To keep pace: Production facilities being built in Australia; a plant site acquired in Brazil; a new factory to build complete machines in Glasgow, Scotland.

International Harvester says: "The (export) picture is excellent and getting better. Last year we exported 35 per cent of some products; the over-all average was 30 per cent. We're finding new markets—Pakistan, Ceylon, other Pacific areas not normally thought of. If they'd improve the dollar shortage in countries like Brazil, Chile and Argentina, there'd be no end to the business we could do there."

Allis-Chalmers and International Harvester equipment team up on grading job

Metallizing Co. of America

Metallizing Takes Hold

FROM 6000 to 8000 companies have adopted metallizing since its introduction in the U. S. about 25 years ago. Developed in Germany around 1918, the process was brought to England two or three years later.

Most metallizers use the process in maintenance or in the making of their own products. Only one-sixth of the metallizers are in the jobbing business, estimates Donald Watson, Metallizing Engineering Co. Inc., Westbury, N. Y. That company says that rapidly increasing use of metallizing in the production of original equipment is boosting sales.

K. W. Kenshol, Metallizing Co. of America, Chicago, another maker of metalliizing equipment, comments that business has been increasing each year.

Uses—Metallizing protects structures, such as tanks and bridges, from corrosion. F. W. Gartner Co., Houston, has sprayed zinc on a flare stack, metallized over 100 "Christmas trees" installed in offshore oil operation and sprayed the diving tower at the Shamrock Hotel with aluminum.

Both time and money are saved by metallizing worn parts, such as shafts, bearings and cylinders.

Technique—Two types of equipment are used. Low melting point materials, such as lead and zinc, and hard-facing materials of the boron-silicon type are sprayed on in powder form. The powder coating is torch-fused to produce the coating.

In another method, a metal wire is fed through a combustion unit. As fast as it is melted, a concentric air blast atomizes it and projects it 4 to 10 in. to a prepared base metal. After metallizing, parts can be machined or ground.

Blasting with grit or sand prepares a surface for metallizing. A rough thread is used on cylindrical surfaces. A small hand unit will spray from 7 to 100 lb an hour. Practically any metal can be sprayed to most metals, cloth, wood, plastic and glass.

New Ways—The demand for automation is putting metallizing equipment into production lines. For high temperature aircraft uses, an aluminum-oxide-ceramic material that can be sprayed on has been developed.

Texas Coast Rides High

Texas' gulf coast is rivaled only by the Pacific coast as the boomiest area in the country.

A year and a half ago, STEEL reported that metalworking was moving in on the Texas coast (STEEL, Nov. 29, 1954, p. 46). At that time, a Houston Chamber of Commerce survey listed 194 metalworking plants with a total investment of $310.5 million. They had $5.3 million worth of expansion under way.

Later information puts the number of metalworking plants at 221. Net worth has climbed to $345 million. Expansion plans valued at $6.6 million are in the works.

Despite this local prosperity, Houstonians point out that all too often basic materials native to Texas (magnesium, aluminum, steel) are shipped to other parts of the country. They return to Houston as fabricated products.

In a current issue of the magazine *Houston*, John Clemens, magnesium sales department, Dow Chemical Co., says: "Industrial investors are justifiably conservative. We must demonstrate our demand. But with local demand already going cross country to be satisfied, aggressive industrialists will put plants here to meet that demand."

Design for Profit

Competition is putting new pressure on product development. Here's the story of how and when it makes sense to let specialists handle the headaches

"IT WOULD COST us more to draw up specifications than it would for them to do the job."

That's how many executives describe the work of Visioneering Co., the Cleveland engineering design consultant.

Blue Chip — "General Motors and General Electric are customers of ours," says Clark R. Bennett, Visioneering's vice president. "We're fabricating a transmission housing for Allis-Chalmers; for Thompson Products we've designed and built consoles for electronic components. We're making parts of the 'distant early warning' radar system for Bell Laboratories. We're designing the platform for Ryan's vertical take-off aircraft. We helped design ACF's Talgo train; we're redesigning a commercial washer for a laundry equipment maker."

Visioneering was formed in 1942 to do design engineering. It got its first production contract in 1952, when it developed shock-proof undercarriages for the Nike and for radar units.

Shifting Gears—"This contract is diminishing," says Mr. Bennett. "Last year, it accounted for much of our $3.6 million sales volume. We hope that it will be replaced by contracts for magnesium radar component cabinets, which we now build. But within the next five years we plan to alter our sales mix so that we get a 50-50 split between contract production and design and prototype work."

One example of the direction: The Chesapeake & Ohio Railway conceived a new Railvan as its answer to piggybacking. It has standard trailer hitch and retractable wheels for road hauling. Visioneering participated in this project and is building two prototypes. Says Mr. Bennett: "One hundred of more of the Railvans will make up a train. We're shooting for the initial production order for 250."

Sell Points—People are Visioneering's biggest asset. Top engineers have been working together since Pearl Harbor. Mr. Bennett heads up the sales group. He's helped by Van Syoc, a specialist on Detroit affairs, whose major job is to build auto industry markets.

Engineering and sales talent are solidly backed by Visioneering's craftsmen. Machine operators are on a first-name basis with executives. They add their production know-how to every job that goes through the shop. Today, Visioneering's payroll totals about 150, compared with some half-dozen when it was founded.

Tribute—Says one client: "We employ companies like Visioneering for one of three reasons: They have specialized experience in a new field we're investigating; they bring a fresh viewpoint to our problems; or we can't handle the design workload ourselves."

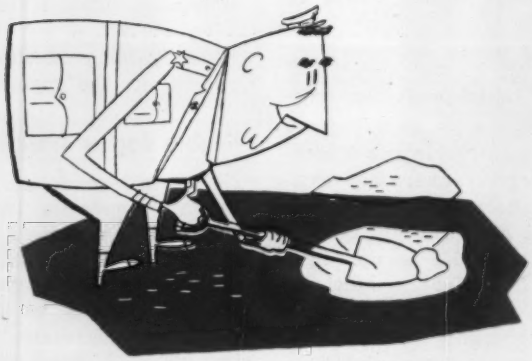
But dollars and cents are the main reason. Visioneering is organized for product design and development. Often, it can take an idea from scratch-pad doodlings to finished product for less than it would cost a company geared primarily for production to merely complete the engineering.

Hughes Begins Training Plan

Hughes Aircraft Co. will establish an apprentice training program which is said to be the first of its kind in American industry. Designed to help alleviate the nationwide shortage of skilled technicians in electronics, the three-year program is set up this way: On-the-job training, 36 hours a week; electronics laboratory training, 4 hours a week; and technical instruction in the classroom, 6 hours a week. About 60 men will begin training in mid-June.

Laboratory work will be done in a new unit under construction at Hughes's El Segundo, Calif., plant. Graduates will receive a rating of "electronic systems technician journeyman" and will be qualified to work in many upper level skilled jobs involving development and production of such Hughes products as electronic control systems for interceptor airplanes and Falcon guided missiles.

Continual engineering conferences provide the spark that keeps Visioneering on its creative toes. They help sell the company's services, too. Prospective clients are encouraged to send design men along to sit in



Authorization passes Congress without demur as . . .

Military Sets Building Plans

CONSTRUCTION, still one of the liveliest segments of the economy, will get another pep-up with about $2-billion worth of military building.

Authorization was approved in the House, 377 to 3. Few changes are expected in the Senate. The Air Force gets the lion's share, $1.14 billion. The Navy will receive $401.2 million and the Army, $304.6 million. Additional provisions bring the total to around $2.1 billion.

Building projects on guided missile bases and launching sites figure heavily in the program. The Army alone will spend about $36.6 million (some 12 per cent) of its authorization that way. Also included are airfield improvements and additions to defense warning systems like SAGE.

GI Loans: Overdrawn?

The GI home loan program, due to run out in July, 1957, may not be renewed. "There seems to be little enthusiasm in Congress" for an extension, according to Rep. Albert Rains (Dem., Ala.) who has introduced a bill to extend the program four years.

The importance of GI housing to the homebuilding industry is pointed up by Joseph B. Haverstick, president, National Association of Homebuilders: "New GI housing accounted for at least 400,000 units, or more than 30 per cent of all 1955 starts; and for more than $4 billion of our gross national product. It provided more than 400,000 man-years of employment on-site and at least an equivalent amount of off-site employment."

The Veterans Administration is considering cutting off new commitments in January if no renewal is forthcoming.

Consent Decree Blasted

Several Congressmen are dissatisfied with the Justice department for settling the antitrust suit against American Telephone & Telegraph Co. and Western Electric Co. by consent decree.

Charges Rep. James Roosevelt (Dem., Calif.): "It solidifies and gives government sanction to the monopoly which the complaint was designed to break up and makes impossible the bringing of any further action by future administrations."

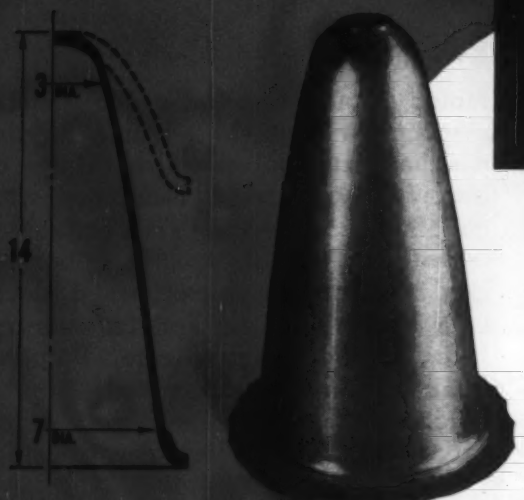
Here and There

- The armed forces are putting more money into studies of vertical and short takeoff aircraft.
- Leaders of federal employees want a 35-hour week to offset effects of automation. They're asking for provisions to set up and pay for retraining of employees affected by technological advances.
- Atomic Energy Commission issues 55 more permits for access to restricted data which are of use to permit holders in their business. Look for pressures on industry to assume more of the research and development of a civilian atomic power industry.

Meet Joseph Malborn: He's serving as a consultant on rolling mills to the metalworking equipment division, Business & Defense Services Administration. For 25 years he was with United Engineering & Foundry Co. He was in charge of research on cold-rolling equipment and served in an engineering liaison capacity between United and the company's associate firm in Sheffield, England. Earlier in his career, he worked for U. S. Steel and was general superintendent of Sharon Steel Corp.'s sheet mill division.

HEMISPHERES TO 38" DIAMETER,

with 3/8" max. wall thickness, are readily formed on the Cincinnati Hydrospin. Part wall can be tapered or have constant thickness. The starting blank is a flat disk or dished preform. Almost any ductile metal can be used. Other machines available for parts and hemispheres larger than 38".



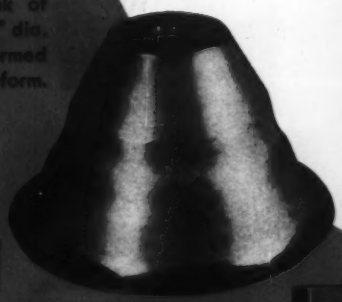
complicated contours cost less by Hydrospinning!

The parts shown here were formed by *tracer* Hydrospinning at substantial reduction in cost over that of previous production methods. These parts were produced in far less time . . . are more accurate . . . have increased strength with greater resistance to fatigue failure . . . required less material . . . and were made without compromising on material requirements.

If difficult-to-form contoured components are one of your production headaches, get the facts on Hydrospinning. Call in a Cincinnati Milling field engineer. For a detailed description of the process and machine specifications, write for new Bulletin M-1873-2.

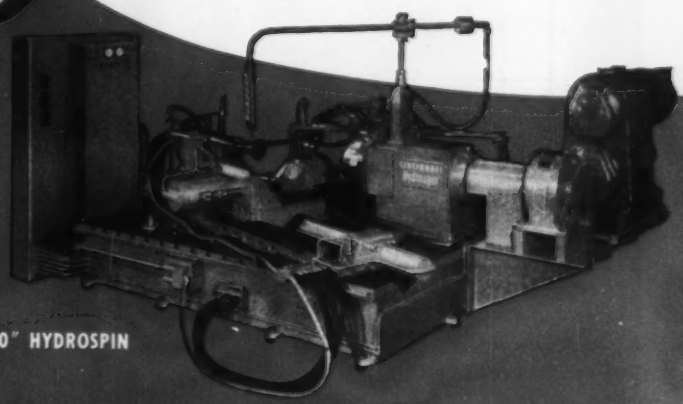
PARABOLIC-SHAPED PART

formed in one pass in two minutes. Starting blank of 61 S0 aluminum, 11 3/8" dia. x 3/16" thick, was preformed on a Cincinnati Hydroform.



COMPOUND CONTOURS

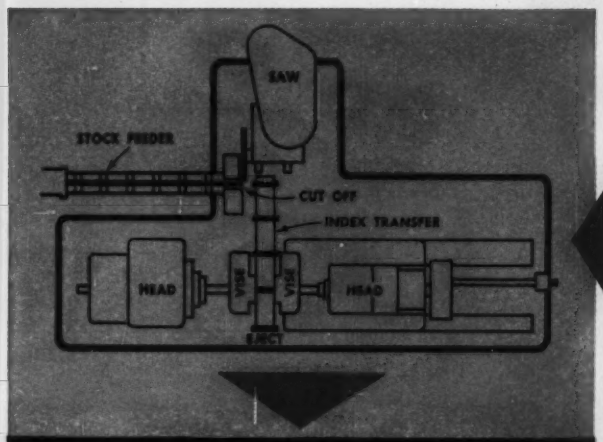
of this part were formed in one pass in one minute. Material is mild steel.



CINCINNATI 42" x 50" HYDROSPIN

CINCINNATI **Hydrospin**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

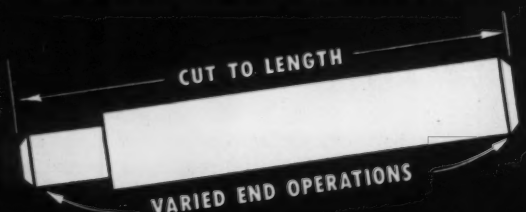


HOT BED OF ACTIVITY

Motch & Merryweather's new transfer machine widens the horizon for the simultaneous double-end machining of bar stock or tubing. Combined with cut-off to accurate length are: centering, chamfering, turning, drilling, or boring. Box mill turning is performed along with center drilling and chamfering. From stock pile to discharge, all operations can be fully automated. For the quickest answer to speed your stock processing, send us your part drawing.

Simultaneous

STOCK CUT OFF and DOUBLE END MACHINING



THE MOTCH & MERRYWEATHER MACHINERY CO.

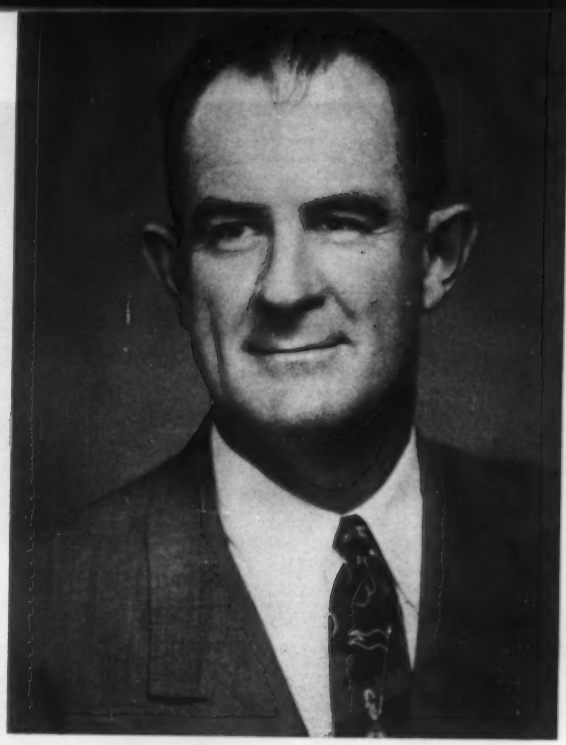
MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

M & M No. 60-TB transfer machine. Two models handle lengths up to 60" and diameters to 4".

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, AND SPECIAL MACHINERY

Management at Work



E. L. Auker: Pitcher Turned Salesman

"DISTRICT SALES MANAGERS hold the key to our sales success," says Elden L. Auker, sales manager, Bay State Abrasive Products Co., Westboro, Mass.

This former pitching great (remember his submarine delivery?) for the Detroit Tigers, Boston Red Sox and St. Louis Browns still thinks in terms of team effort in selling Bay State's grinding wheels and other abrasive items.

Growing Pains—"After I was appointed sales manager (Mar. 1, 1953), we decided that our first aim should be to revise our national selling program for our products." Result: Four district offices (Detroit, Chicago, Cleveland and Pittsburgh) were expanded to include five new territories—West Coast, South, New England, Connecticut and Philadelphia.

"From then on our district managers were responsible for hiring and firing personnel as well as developing sound distributor organizations," he emphasizes. District sales managers also are responsible for keeping Bay State's Sales Policy Manual up to date. They are asked to submit changes, and all nine managers must approve a suggestion before it can be put in effect.

Why?—"When nine men from different sections of the country contribute their ideas, we are assured of having a national sales policy," explains Mr. Auker. Another advantage: When district managers make the rules, they will see that their salesmen follow them.

Forecasting—"Every salesman on our staff helps estimate sales," says Mr. Auker. Each district salesman makes a written report to his district manager every 60 days. He bases analysis of his territory on the salesmen's reports. Mr. Auker bases his corporate brief for the executive committee on the thinking of his nine district managers.

Budget—Each year district managers submit their sales estimates for the following year. Before he sees their reports, Mr. Auker makes his own forecast for each territory. "It's amazing how close we usually are," he explains.

Based on the sales forecast, each territory's operating budget is determined—including funds for such things as larger offices, more warehouse facilities and additional personnel. While the district manager has complete charge in hiring, he often sits down with Mr. Auker to see if there is a "company man" ready for the opening. "This," says Mr. Auker, "helps keep morale high."

Elden Auker also serves on the company's five-man executive committee. "Baseball and business have much in common," he comments. "It takes team effort all the way to win pennants or keep your business growing."

Remarkably quick, easy assembly and welding of the five .209" gage formed parts that comprise a modern compressor housing is possible because each part is precision formed to extremely exacting dimensions. Additional machining is not necessary. Each part is finished, ready for final assembly, as it comes off By-Products' new high speed press line.

Now—fast stamping to close tolerances!

WHAT CAN OUR NEW PRESS LINE DO FOR YOU?

■ By-Products Steel Co.'s modern new high speed press line adds light gage pressing equipment to its already extensive heavy plate shaping facilities. The line will satisfy manufacturers who need precision formed parts from 16-gage material well into heavier plate thicknesses. And dependability is assured by the combination of the very latest equipment and skilled craftsmanship.

We've made the investment in equipment and manpower. You pick up the benefits in lower overhead...fewer production steps in your shop... reduced freight costs...virtually no scrap loss...lower production costs.

Get the facts! Write, outlining your interests, to Manager, Marketing Service, 832 Lukens Building, Coatesville, Pennsylvania.

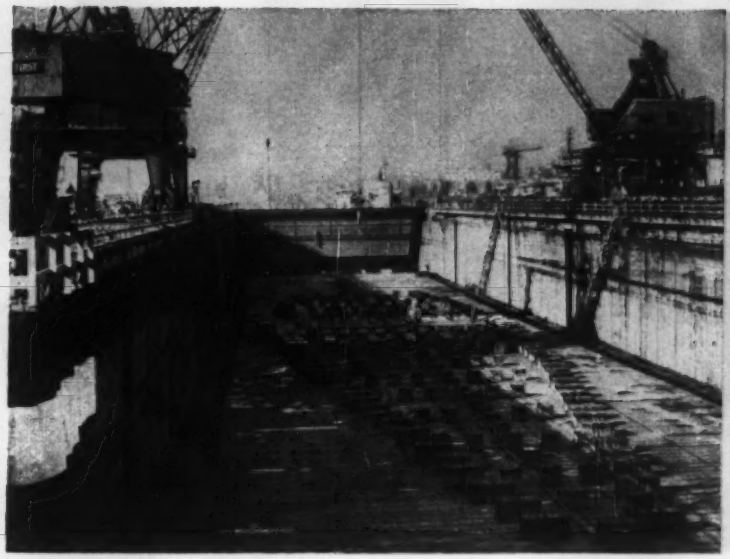
■ PRESS LINE UNITS

1. 900 Ton Hydraulic Press
2. 600 Ton Mechanical Press
3. 150 Ton Punching Press
4. 45 Ton Punching Press
5. 22 Ton Punching Press
6. Trimming Press
7. Annealing Furnace
8. Washing Machine
9. Automatic Loader and Greaser

Units are linked by reversible conveyors for fast, economical production.

BY-PRODUCTS STEEL CO. LUKENS

A DIVISION OF LUKENS STEEL COMPANY, COATESVILLE, PENNSYLVANIA



Lukens Steel Co.

More Ships on the Ways

(value in millions)*

	Commercial	Navy	Total
1956	$228	$668	$896
1955	100	596	696
1954	230	362	592
1953	476	615	1,091
1952	544	428	972
1951	111	108	219

*Jan. 1 each year at private seaboard yards
Source: Shipbuilders Council of America

Shipbuilding Backlogs Rise

Yards are expected to take shipments of steel amounting to 825,000 tons. Backlog for merchant ships and Navy craft stands at $1.16 billion, best mark since 1953

KEELS MAY be laid this year for 20 seagoing merchant ships (mostly tankers). With 30 vessels under construction or on order as of Apr. 1, merchant ship volume is double what it was a year ago.

Gross tonnage of the 30 ships under contract totals 420,000; their value is close to $325 million. Thirteen are scheduled to be delivered this year.

Best Backlog — Since Jan. 1, when unfinished work stood at $896 million (see table), private seaboard yards have received Navy contracts amounting to $166.5 million. This brings the backlog to $1.16 billion (including other new business), the largest since 1953.

Steel shipments this year to the shipyards will hit 825,000 tons, compared with 601,234 tons in 1955.

Subsidy Plans—With the exception of three large tankers placed with Bethlehem Steel Co.'s Shipbuilding Division by a Greek operator, all merchant ship construction at seacoast yards is government subsidized.

Four passenger-cargo vessels are on order, with subsidies covering 40 to 42 per cent of their cost. Newport News Shipbuilding & Dry Dock Co. has orders from the Grace Lines for two 15,000-tonners (cost, $23 million each). Moore-McCormack Lines Inc. has two 18,-200-ton ships being built by Ingalls Shipbuilding Corp. (cost, $24.5 million each).

To 1970—Some 300 ships operated by 16 lines are involved in the subsidized fleet. Contracts with the government, which extend to 1970, call for replacements of 20 ships annually.

In addition to seven destroyers and three frigates placed so far this year, the Navy's 1956 program includes ten landing craft, four patrol boats, two ammunition ships, two escorts, two mine sweepers and one submarine—all to private yards.

Trends—Bethlehem's Shipbuilding Division notes trends to larger and faster tankers, large combination carriers of oil, ore or other bulk cargo and further development of craft like the *S. S. Marine Dow-Chem* for the transportation of chemicals in bulk.

The emergence of the so-called roll-on, roll-off ship on a substantial scale is foreseen. While the idea is not new and several small craft of this type have been in operation for some time, high cargo handling costs are speeding their use. Door-to-door deliveries may not be too far off; a prototype of a large ship of this type is being built.

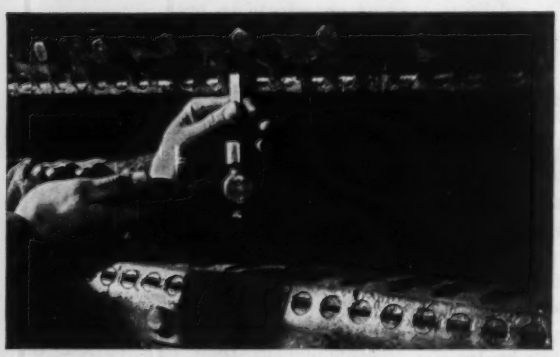
U. S. Drop — U. S. tonnage launched in 1955 was 73,004, off 403,980 tons from 1954. Japan recorded the largest gain: Up 415,-325 tons. Great Britain remains the leader with 1,473,937 tons launched last year; Germany and Japan follow. U.S. ranks 12th.

Turbines Ordered for 1959

Order backlogs at General Electric Co.'s Large Steam Turbine-Generator Department total more than 19 million kw in capacity.

Shipments are scheduled as far ahead as 1959, and some utilities are considering the purchase of units for delivery in 1960 and 1961.

How Great Lakes Steel *planes* quality



144 BURNER JETS automatically plane both top and bottom of slabs to remove surface cracks and impurities.

HAND SCARFER double checks slabs to make certain that any flaws extending below surface are also removed.

Just a dramatic picture of a steel mill in action? Far from it! These sizzling-hot sparks tell another very important story about the special care that goes into making steel at Great Lakes.

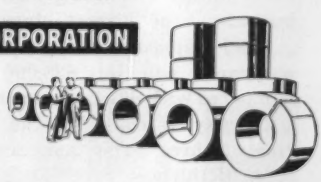
They're bouncing out from beneath the burner jets of the automatic hot scarfing machine. Scarfing? Just as you plane wood to get a smooth, flawless surface, so does the scarfer automatically burn away the top and bottom "skin" from each slab of steel. Then, jets of water sweep the slab clean.

The end result: you get a higher quality, deep-drawing sheet with an inherently flaw-free surface. That's one more important reason why you should call Great Lakes about your steel needs. And remember, Great Lakes customers get what they call for.

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION



District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

Out the Door: How Auto Suppliers Avoid It

1. By modernizing facilities: A company making parts must keep up with new methods of manufacturing

2. By maintaining quality: The standard has to be high through a complete production run

3. By meeting delivery schedules: Partmakers must get the right number of parts to the right place at the right time

4. By competing on costs: Cost-plus contracts won't be accepted

5. By re-evaluating markets: The check can turn up new business and can answer questions about diversification

Pressure on Partmakers

EVER SINCE Motor Products Corp. and Vinco Corp., Detroit, announced they were getting out of the automotive part business, more partmakers are asking: What must we do to survive?

R. J. Nixon, president of Motor Products and Edward E. Butler, Vinco's president, both indicate that integration and price squeezing by large auto companies are prime factors in causing them to cease being automotive suppliers.

Spokesmen for the auto manufacturers say that uneven quality, inability to meet deliveries and noncompetitive prices have caused some suppliers to lose contracts.

Trend — There has been, and probably will continue to be, integration of part facilities by the Big Three. In an era of high profits (and higher taxes), large companies find it good business to put surplus capital into expanding facilities. Part manufacturing is a logical choice.

General Motors Corp. is the most fully integrated of the auto companies. Ford Motor Co. is catching up rapidly with its stamping plant in Sandusky, O., a recently announced glass plant and an aluminum foundry in Sheffield, Ala.

Chrysler Corp. is further decentralizing its assembly operations. It doesn't have enough capital to move into part manufacturing on a big scale. Neither American Motors nor Studebaker-Packard has enough money to buy or build additional part facilities.

Reversal—Two factors could influence this trend. Talk of "monopoly" coming out of Washington may cause large companies to slow down merger operations. It seems probable that this antitrust pressure in Congress will continue.

Less likely: An economic downturn in the next year or two would cause auto makers to hang on to acquired capital. Part suppliers who can hold out would be in a more favorable market position. Meanwhile, they'll have to take a good look at the industry-vendor relationship.

Dancers—As one partmaker puts it: "Part suppliers must realize they are not proprietary businesses in the true sense of the word. They have to dance to the tune auto companies play."

Vendors can't count on long-range plans to amortize equipment or work out cost cutting methods. Each major model change finds them scrapping much of their old tooling and starting over again. They're lucky if they can produce one item for more than two years.

The growing tendency toward a major model change-over every other year only makes the situation tougher. Auto companies face this same problem, but they have the size and capital to weather it.

Methods—Each carbuilder has a large product analysis department which decides whether it's cheaper to make or buy a part. If the decision is to buy, quality, dependability and price are major factors in determining which suppliers will be eligible to bid.

Cost analyses by the auto makers set target prices which will allow a fair profit for vendors. But prices often are based on modern manufacturing equipment and methods. Many partmakers don't have these facilities.

Bidding against each other, vendors may take contracts at break-even prices. In trying to cut costs to make a profit, quality drops, deliveries are missed and the supplier doesn't get any more contracts.

One partmaker asserts: "The auto companies don't do it deliberately, but they don't understand that we haven't the same equipment they have. Our company would like to work on a cost-plus basis, but today's competition just won't let us. We have to take some contracts even though we know we'll lose money." Lack of cost-plus contracts forced Motor Products out of the field.

Design — Automobile styling is trending more and more to inte-

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Dodge-Built for Big Jobs

V-8 engines, ranging up to 220-hp, power these tandem axle trucks. Gross vehicle weights run from 31,000 to 46,000 lb; gross combination weights from 45,000 to 65,000 lb. Wheelbases are from 141 to 192 in.

grated units. Vinco Corp. made bumper guards. Many of next year's models will have bumpers with the guards built in. Auto purchasing agents are giving contracts to companies which can supply the entire bumper unit.

Solutions — Carbuilders usually find it profitable to make high volume, high dollar parts. No matter how integrated they become, hundreds of parts still have to be bought from outside suppliers. Vendors admit that for every contract that loses money there are two or more which can be profitable.

Suppliers will do well to aim for small contracts, or for contracts which have some assurance of lasting more than a year or two. Many partmakers have found that supplying the truck business is more profitable for just this reason.

It also will pay to acquire the best in plant and equipment and to keep up with improvements. Companies which think last year's tools will do or those which don't want to leave a 50-year-old plant are kidding themselves. Such facilities can't keep up with today's automated layouts.

Service—A manufacturing staff executive for a major auto company points out: "One area that part suppliers are getting into is making service parts." With each production run, auto makers turn out additional parts to fill repair and service needs. Sometimes supply of these parts is exhausted.

When this happens, auto makers usually find it cheaper to lease or loan their dies to suppliers which can turn out the extra parts needed. This is one spot where cost-plus operations are possible and profitable.

Sidelight — Diversification into other fields may not be the answer to suppliers' problems. But diversification into more automotive lines can be good insurance against product closeouts. Rheem Mfg. Co., New York, is a good example. The company recently announced that its automotive part division is moving from Vernon, Calif., into a $7-million automated plant at Fullerton, Calif.

Rheem makes bumpers, bumper guards and hangers, coil and leaf spring suspension systems, as well as automotive stampings and accessories. Company officials say that some of the additional space in the new plant is for expansion of diversified products.

Going West? — Rheem's announcement, coming on the heels of Motor Products' and Vinco's statements, led some persons to believe that a move to the West Coast might be healthy for withering partmakers. This doesn't seem likely now.

However, the west coast market is expanding. In 1955, total auto sales were 24.9 per cent higher than they were in 1953. In California, Oregon and Washington they were 43.8 per cent higher.

No Trend—But auto plants going up on the coast are primarily assembly facilities. So far, it's still cheaper to ship most parts from the Detroit area.

U. S. Auto Output

Passenger Only

	1956	1955
January	611,190	659,508
February	554,801	674,951
March	575,559†	792,436
April		752,245
May		723,868
June		648,412
July		658,696
August		613,705
September		460,443
October		517,788
November		749,061
December		682,256
1st Qtr.	1,741,550†	2,126,895
Total		7,933,369

Week Ended	1956	1955
Mar. 10	132,840	171,346
Mar. 17	131,207	176,194
Mar. 24	131,287	178,068
Mar. 31	125,850	177,295
Apr. 7	133,354	168,002
Apr. 14	135,043†	175,133
Apr. 21*	134,500	180,647

Source: *Ward's Automotive Reports*
†Preliminary *Estimated by STEEL

Exhaust Notes

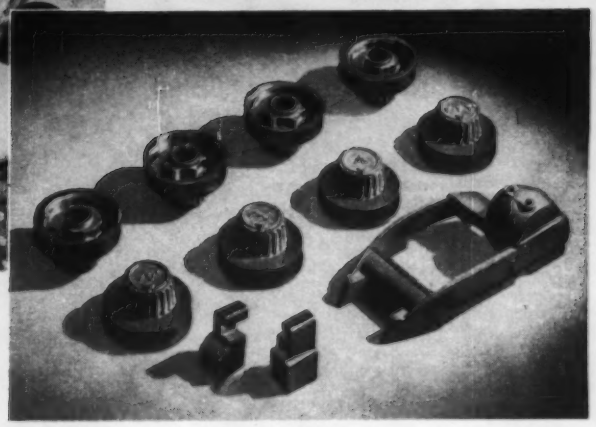
Total car population in the U. S. can well be in the neighborhood of 70 million by 1965, says W. C. Flaherty, director of business research for Chrysler Corp. Then, auto makers will have to build 8 million to 9 million cars a year to meet the population demands . . . Mack Trucks Inc., New York, boasts sales of $38 million in the first two months of this year, compared with $20 million for the same period last year . . . Ford Motor Co. reports that its Model E car will cost $250 million to develop. It is expected to appear in mid-1957 for 1958 production.

NUMBER 2 OF A SERIES

PRODUCTION SHORT CUTS WITH

ZINC

DIE CASTINGS . . . . .



SEWING UP A PRODUCT DESIGN AT SINGER

Part of the story behind the development of the Singer Automatic Zigzagger (an attachment for use with Singer sewing machines) reveals how—through the use of ZINC Die Castings—efficiency and economy can go hand-in-hand. The castings in the new assembly are shown at the right.

The first consideration in developing the Zigzagger was to establish a basic design which would permit milady to simply and efficiently create a variety of decorative effects merely through the interchange of different stitch patterns. The ultimate design called for some unusually shaped components which led Singer engineers to the specification of ZINC Die Castings. These parts are the cover frame, two presser bar seats and the eight interchangeable stitch patterns.

The economy of die casting the Zigzagger components stems from high speed multiple-cavity production, achieving dimensionally accurate, ready-to-assemble parts. The eight stitch patterns are cast with the sewing design engraved on each pattern head and, as can be seen in the underviews, unusually shaped cam tracks also are obtained on these castings. The smooth surfaces of the ZINC Die Cast cover frame require little preparation for a handsome paint coating.

For possible answers to *your* production problems, send for our brochure and contact any commercial die casting company.

Send for your copy.

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

ZINC FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on

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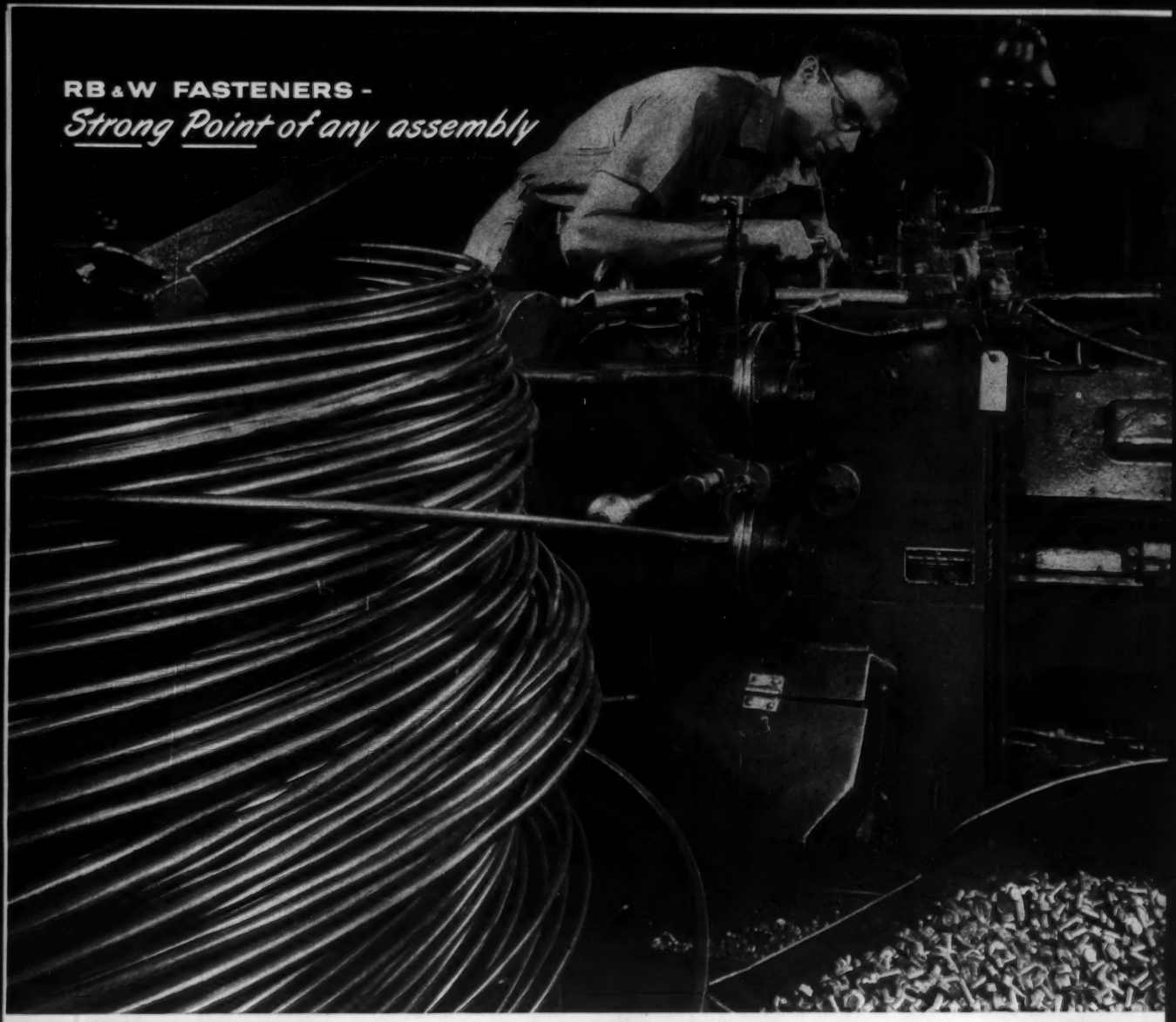


Getting set to pound some strength into bolt heads

HERE ARE three essentials for producing strong, low cost fasteners ... an ingenious machine, indispensable skill and proper material.

That's a cold header you see. It deals wire terrific blows, forcing it to flow cold inside dies. Skillfully set up, it spills out bolt or screw blanks by the thousands per hour—all with *strong*, sound heads.

Making precise adjustments on the machine is Douglas Dunaway. With RB&W for ten years, he's one of many long-timers whose experience assures high quality output from a vast array of modern equipment.

The cold heading method (an RB&W development that revolutionized bolt making) calls for use of uniform, high quality raw material. With constant quality control, RB&W makes *sure* cold headers get the proper "diet".

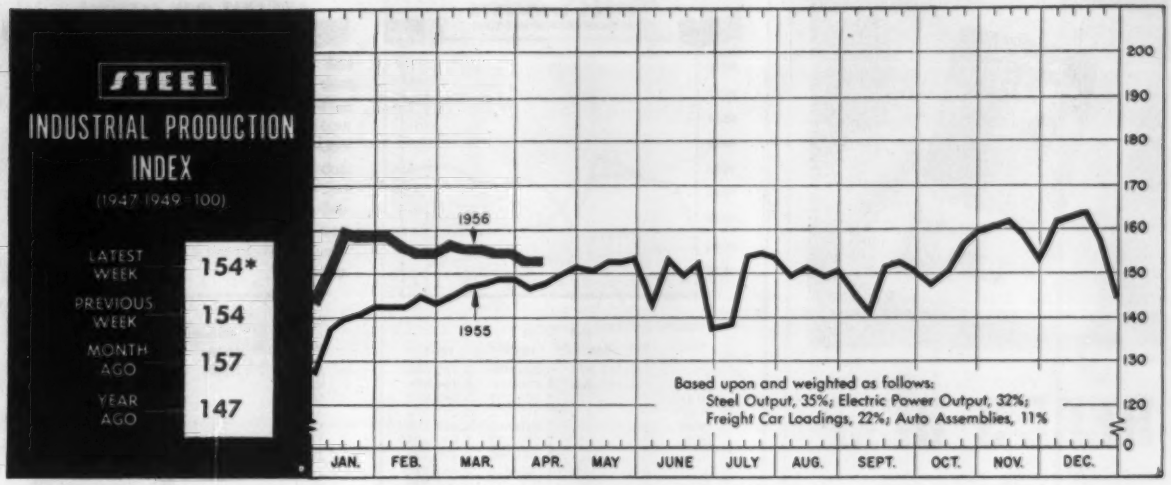
It's this combination of facilities, experience and quality control in all RB&W plants that assures more fastener quality for your money . . . a truly reliable supply source . . . and strong fasteners that never let you down.

Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

R B & W

110th year

Plants at: Port Chester, N. Y., Coraopolis, Pa.; Rock Falls, Ill., Los Angeles, Calif. **Additional sales offices at:** Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco. **Sales agents at:** Milwaukee; New Orleans; Denver; Seattle. **Distributors** from coast to coast.



*Week ended Apr. 14

Castings Reflect Good Business Level

EXPANSION in heavy industry and large backlogs for railroad passenger and freight cars are the key elements in the drive by the iron and steel casting industry for one of the best years in its history. This situation, in turn, reflects the high level of business in general because of the across-the-board use of castings.

Statistics for the industry are available only through January (see charts on pages 84 and 85), but operations since then have been at the same high levels established late in 1955. Gray iron castings, the largest segment of the industry, are following the sidewise trend of business in general. But an upturn is in prospect when the automotive industry beefs up its production schedules later this year. Molds for heavy steel ingots are in strong demand because of the high rate of steelmaking operations, and this situation will prevail at least through the second quarter, with a possible letup in late summer. Unfilled orders at the end of January were the highest since August, 1955.

Malleable Doing Well — Shipments of malleable castings have held up surprisingly well, industry spokesmen say, especially in view of the large portion usually taken by the automotive industry. While both shipments and backlogs fell in January (and will probably show further declines in February), the industry is running at near peak levels. At the Market Development Conference of the Malleable Founders' Society this month, salesmen were frank to admit that even though they would like more large orders, they wouldn't know what to do with them. Here again, a pickup in automotive business later this year will send both shipments and backlogs soaring.

As for steel castings, the significant development is the tremendous rise in unfilled orders to 519,401 tons, or about one-third of

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,477[1]	2,483	2,284
Electric Power Distributed (million kw-hr)	10,800[1]	10,846	9,602
Bituminous Coal Output (1000 tons)	8,635[1]	9,930	8,200
Petroleum Production (daily avg—1000 bbl)	7,160[1]	7,171	6,828
Construction Volume (*ENR*—millions)	$529.8	$276.5	$272.7
Auto, Truck Output, U. S., Canada (*Ward's*)	172,933[1]	170,998	218,078
TRADE			
Freight Car Loadings (1000 cars)	690[1]	685	674
Business Failures (Dun & Bradstreet)	225[1]	217	204
Currency in Circulation (millions)[3]	$30,300	$30,318	$29,841
Dept. Store Sales (changes from year ago)[3]	−15%	+7%	+8%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$20,494	$20,623	$17,705
Federal Gross Debt (billions)	$276.0	$276.3	$277.1
Bond Volume, NYSE (millions)	$23.8	$24.9	$18.4
Stocks Sales, NYSE (thousands of shares)	12,937	14,194	14,338
Loans and Investments (billions)[4]	$85.5	$85.6	$85.1
U. S. Govt. Obligations Held (billions)[4]	$27.9	$28.0	$34.4
PRICES			
STEEL's Finished Steel Price Index[5]	209.10	209.10	194.53
STEEL's Nonferrous Metal Price Index[6]	278.0	278.2	237.1
All Commodities[7]	113.4	113.5	110.5
Commodities Other Than Farm & Foods[7]	121.3	121.2	115.7

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1956, 2,461,893; 1955, 2,413,278. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100

HERE'S HELP for your tooling problems

Looking for a tool steel to do a specific job? Want to know where to buy a finishing carbide? This guide has the answers. It is a single source of information on more than a thousand different tooling materials. Knowing the job to be done, you can determine, with the guide, what product to buy and where to buy it. Cross indexes make it easy to locate tool steels and carbides by tradename, or to compile a list of sources for a single type.

JUST PUBLISHED

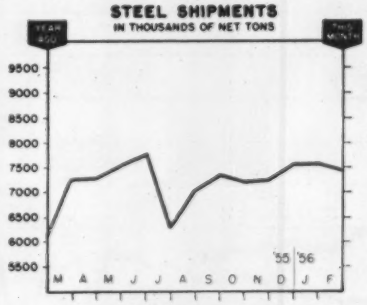
40 PAGES

Copies of the Guide to Tool Steels & Carbides are available from Editorial Service, STEEL, Penton Bldg., Cleveland 13, O., at the following prices:

1 to 10	$2.00 ea.
11 to 50	1.90 ea.
51 to 100	1.80 ea.
101 to 200	1.70 ea.
over 200	1.60 ea.

THE BUSINESS TREND

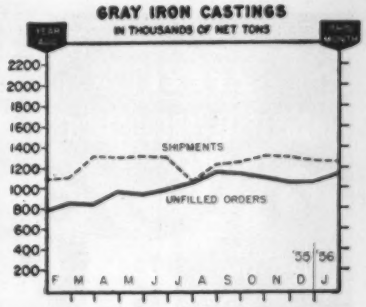
STEEL SHIPMENTS
IN THOUSANDS OF NET TONS



	Net Tons		
	1956	1955	1954
Jan.	7,587,870	6,009,958	5,727,600
Feb.	7,468,393	6,119,900	5,364,978
Mar.		7,268,795	5,583,690
Apr.		7,279,321	5,287,972
May		7,540,889	5,423,168
June		7,770,213	5,887,488
July		6,250,597	4,490,179
Aug.		7,053,615	4,681,242
Sept.		7,378,247	5,004,222
Oct.		7,216,821	5,035,364
Nov.		7,247,994	5,240,209
Dec.		7,580,943	5,448,649

American Iron & Steel Institute
Charts copyright, 1956, STEEL

GRAY IRON CASTINGS
IN THOUSANDS OF NET TONS



	Shipments		Unfilled Orders*	
	1956	1955	1956	1955
Jan.	1,250	1,092	1,158	782
Feb.		1,106		852
Mar.		1,315		842
Apr.		1,294		966
May		1,310		938
June		1,296		982
July		1,070		1,050
Aug.		1,226		1,160
Sept.		1,253		1,151
Oct.		1,310		1,113
Nov.		1,306		1,062
Dec.		1,260		1,075
Total		14,838		

*For sale. U. S. Bureau of the Census

total shipments last year. Industry observers believe backlogs are about as high as they can go, but shipments are still on the way up. "Expansion of the mills and increasing demand for metalworking equipment provide a good outlook for sales of steel castings," say officials of Reliance Steel Casting Co., Pittsburgh. The heavy backlog of freight cars will continue to take large tonnages of steel castings, too. The only thing holding back this segment of the industry is the shortage of steel.

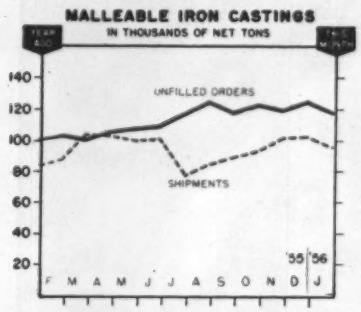
Heavy Orders—Foundrymen are still in the market for equipment in a big way. The new order index of the Foundry Equipment Manufacturers Association registered 169 in February (1947-1949 =100). While down from January's 195.6, it is still far ahead of the 90.4 mark of February, 1955, when the foundry industry was trying to recover from a poor 1954.

Steel Shipments Head Up

Shipments of steel products for February, according to the American Iron & Steel Institute, fell short of the January record (see chart above) but only because the month was two days shorter. A new record is almost sure to be set in March. Output of the nation's steel mills set a record of 10,921,000 net tons for ingots and castings last month. Assuming a scrap loss of 28 per cent (the average for January and February), the net result would be about 7,863,000 tons of steel product shipments, a new record. If April continues at its present pace—nearly 100 per cent of steel mill capacity—shipments this month will be close to 7.6 million tons.

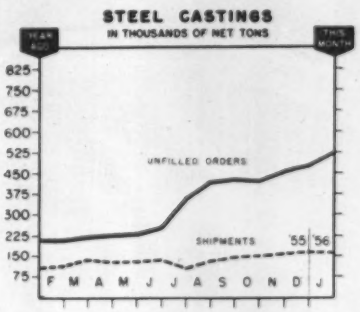
Bank Officials Optimistic

Some quarters are looking for a downturn in general business in the third quarter, based on the heavy accumulation of inventories, especially steel. But economists at the First National City Bank of New York are optimistic. "With or without a strike in the steel industry, stocks of some types of steel are likely to be worked off during the third quarter," they say in the April *Monthly Letter on Business and Economic Conditions*. "If this process of adjustment can continue without depressing the general business level.



	Shipments		Unfilled Orders*	
	1956	1955	1956	1955
Jan.	93.6	82.0	116.5	99.8
Feb.	....	86.0	....	101.8
Mar.	....	102.4	....	99.7
Apr.	....	101.2	....	104.1
May	....	98.4	....	106.4
June	....	99.5	....	107.6
July	....	75.6	....	115.4
Aug.	....	82.4	....	123.4
Sept.	....	87.2	....	116.6
Oct.	....	90.9	....	121.3
Nov.	....	99.3	....	117.0
Dec.	....	99.9	....	123.1
Total	....	1,104.8		

*For sale. U. S. Bureau of the Census



	Shipments		Unfilled Orders*	
	1956	1955	1956	1955
Jan.	158.7	98.2	519.4	201.8
Feb.	....	106.4	....	202.3
Mar.	....	127.5	....	215.1
Apr.	....	120.1	....	221.3
May	....	122.5	....	225.3
June	....	133.9	....	251.4
July	....	97.8	....	354.6
Aug.	....	126.4	....	413.5
Sept.	....	140.8	....	420.6
Oct.	....	145.7	....	418.1
Nov.	....	152.4	....	453.1
Dec.	....	159.0	....	475.3
Total	....	1,530.7		

*For sale. U. S. Bureau of the Census

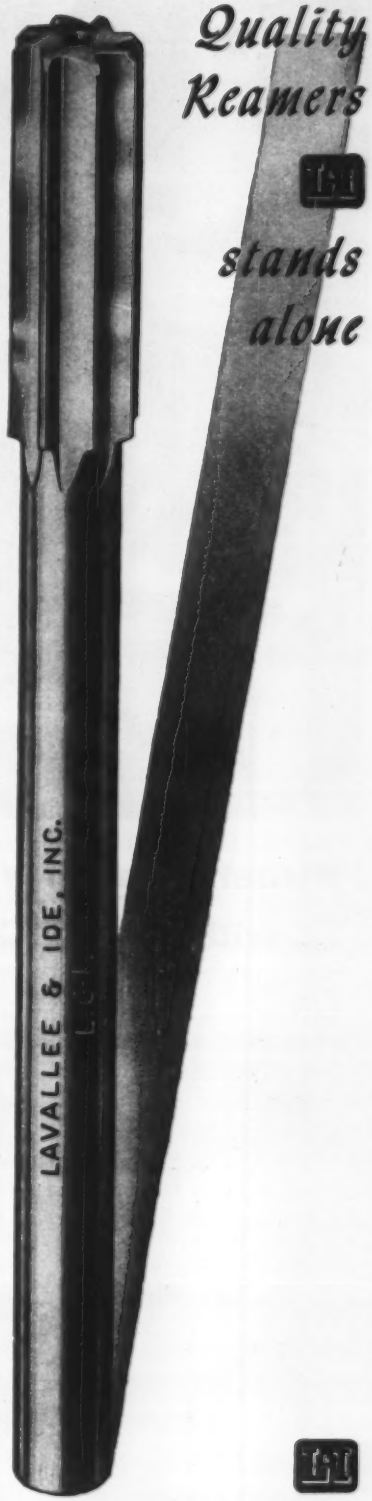
it will be a feat almost without precedent. But the possibility that it will do so seems excellent. The underlying support comes from the immense demand for business plant and equipment and for nonresidential construction of many types. Strength in these lines supports employment, and from them flows purchasing power—at rising wage rates—which sustains consumers' demands and employment in other industries."

Construction Hits New High

Total new construction in the first three months of 1956 is 2 per cent ahead of the corresponding period last year, say the Commerce and Labor departments. Nonresidential construction is a whopping 18 per cent ahead. That's enough to cancel out the 5-per-cent deficit in residential building and leave private construction 1 per cent ahead of this time last year. F. W. Dodge Corp. reports that awards for future construction in the 37 eastern states soared to $2,382,000,000 last month for the highest March in history and the second highest month in the firm's 65 years. Significant is the total for residential awards—$1,105,000,000, the best month on record. The spring splurge should pick up steam in April.

Borrowing Costs Rise 7.1%

The stepped-up pace of the economy has led to some stern measures on the part of the Federal Reserve Board to curb inflationary dangers. Effective Apr. 13, the board increased its discount rate to district banks from 2½ to 2¾-per cent (3 per cent in Minneapolis and San Francisco). Banks around the country were quick to respond, most of them upping their commercial loan rates from 3½ to 3¾-per cent. In terms of the amount paid in interest on a loan, the new rate means an increase of about 7.1 per cent to the borrower. This is the fifth rise in the discount rate since last April, when it stood at 1½-per cent. The board is hoping that the higher cost of borrowing money will slow down the rate of business loans, heavy consumer credit purchasing, increased plant and equipment planned by industry and rising prices.



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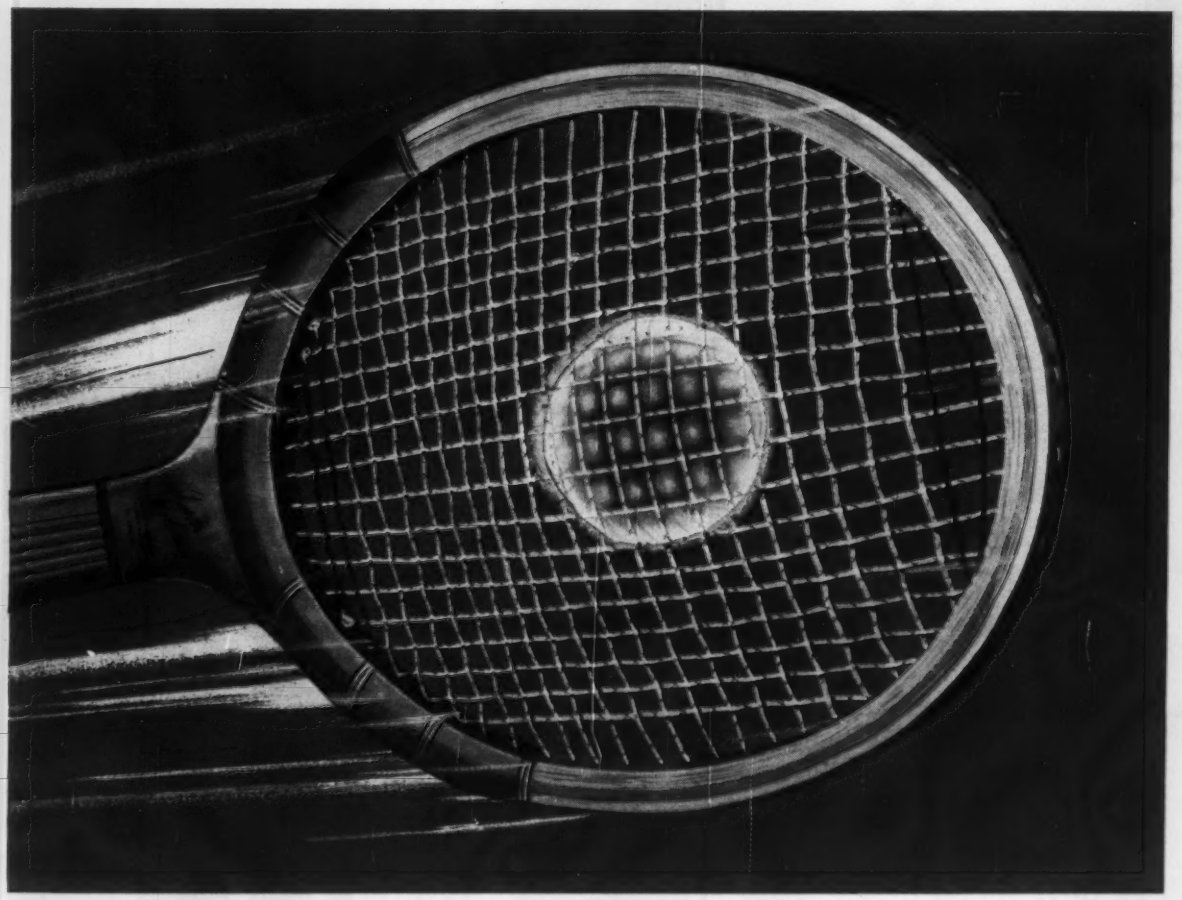

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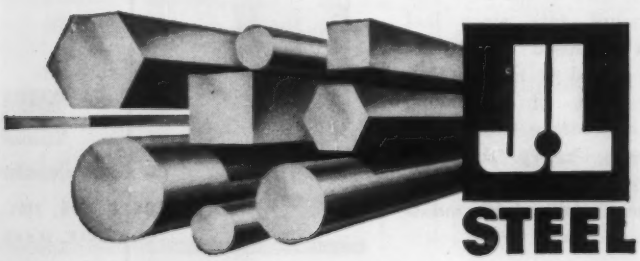

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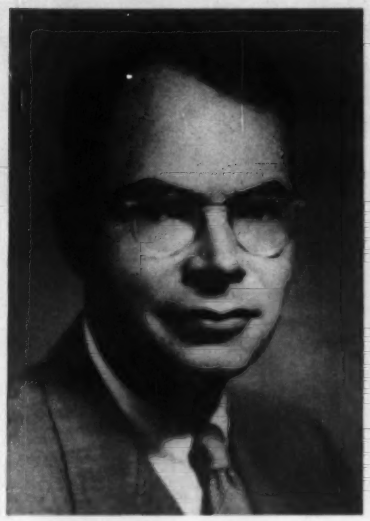


CARROLL L. WILSON
. . . president of Metals & Controls

GEORGE D. GOTSCHALL
. . . Steel Improvement & Forge mfg. dir.

ROBERT D. BLACK
. . . heads Black & Decker Mfg. Co.

Carroll L. Wilson was elected president of **Metals & Controls Corp.**, Attleboro, Mass., and **James W. Fish** was made vice president-manufacturing. Mr. Wilson was vice president-general manager. Mr. Fish was manager of manufacturing.

Milton T. Smith was elected president and general manager, **Marion Power Shovel Co.**, Marion, O., and its subsidiary, Osgood Co. In his previous capacity (vice president-general manager) he served as chief executive officer of both companies. They operate as part of the equipment department of Merritt-Chapman & Scott Corp.

Frank W. Cunningham was elected vice president and general manager of **Abarry Steel Co.**, Camden, N. J. He was secretary and general sales manager of Potts-Farrington Co.

Thomas L. Ward succeeds **W. L. Larson**, resigned, as manager of **Alco Products Inc.'s** plant at Dunkirk, N. Y. Mr. Ward is succeeded by **L. W. Eger** as manager of manufacturing services.

Inland Steel Products Co., Milwaukee, appointed **Richard M. Wille** assistant product manager, roof deck and wall panels. He is succeeded by **N. J. Badten** as assistant product manager, commodity products.

George D. Gotschall was made director of manufacturing at **Steel Improvement & Forge Co.**, Cleveland. He was production manager and prior to that was in charge of research.

Henry E. Little was appointed general superintendent in charge of operations at the Lebanon, Pa., plant of **Cleaver-Brooks Co.**, now under construction. He was chief engineer and assistant superintendent of fabricating and stamping divisions of Phoenix Iron & Steel Co. The new Lebanon plant is expected to be in operation this summer.

Stanley M. Bixler was made general manager, western division, **Crown Cork & Seal Co.**, San Francisco. **Edmund B. Spread**, who has served as acting general manager, was named assistant general manager.

James L. Lewis and **Paul C. Eberhardt** were appointed assistants to the president of **Van Norman Industries Inc.**, Springfield, Mass. Mr. Lewis' duties cover administration and sales; Mr. Eberhardt's, manufacturing and research. Mr. Lewis was with Chicago Pneumatic Tool Co., in charge of sales of automotive equipment to oil companies. Mr. Eberhardt was chief machine tool engineer of Wright Aeronautical Division, Curtiss-Wright Corp.

Robert D. Black was elected president and chairman of **Black & Decker Mfg. Co.**, Towson, Md. He succeeds the late **Alonzo G. Decker. Alonzo G. Decker Jr.** was elected executive vice president. Mr. Black, executive vice president since 1954, was also named chairman of the executive committee.

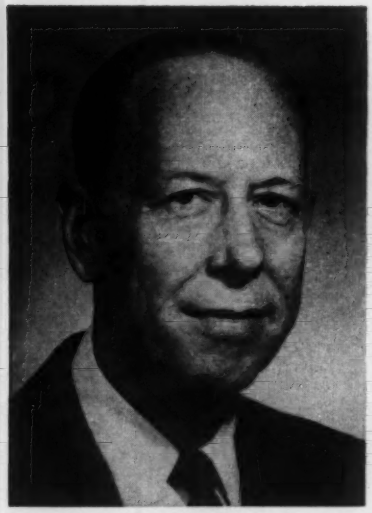
James H. Sutherland succeeds **Philip A. Carlson**, retired, as midwestern regional sales manager of **SKF Industries Inc.**, at Chicago. **M. William Passmore** succeeds Mr. Sutherland as Chicago district manager.

William E. Kennedy was named sales manager, coated steel division, **Life Time Products Corp.**, Youngstown. He was assistant sales manager of Shenango Steel Co.

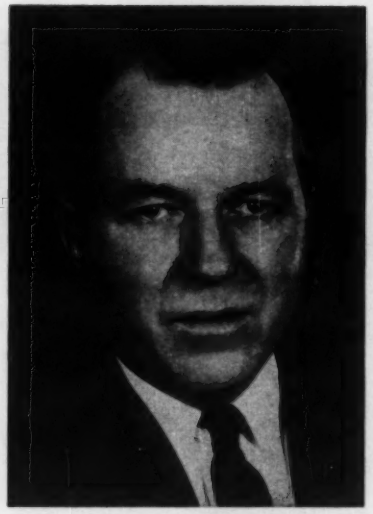
Frank H. Squires was made director of quality control of **Topp Industries Inc.**, Los Angeles. He was quality control manager at Lear Inc.

Woodrow W. Hamilton was made sales manager of **Elgin National Watch Co.'s** new micronics division, Elgin, Ill. He was sales manager for Herold Products Inc.

Addressograph - Multigraph Corp., Cleveland, named **Howard J. Warwick** director of manufacturing, **William F. Daniels** factory mana-



J. J. I. JAMIESON
. . . gen. sales mgr. of Republic Steel div.



ALBERT P. GAGNEBIN
. . . nickel sales dept. mgr. at Inco

H. A. ERB
. . . works mgr. of Elliott's steam div.

ger and **James A. Ferguson** general superintendent.

J. J. I. Jamieson was made general manager of sales, steel and tubes division, **Republic Steel Corp.**, Cleveland. Assistant general sales manager for the last six months, Mr. Jamieson succeeds **J. A. Ireland**, retired.

William E. Baer was made manager of the purchasing department of the Buffalo assembly plant of **Ford Motor Co.** He succeeds **J. Harvey Carter.**

Claud S. Gordon Co. appointed **Samuel Stanton** Detroit district manager.

Simon J. Tombaugh was named manager, east central district, of **General Electric Co.'s** user industries sales department, with headquarters in Cleveland. He succeeds **Edwin H. Howell** who was elected a commercial vice president with headquarters in Dallas.

Charles D. Cummins was made Seattle district manager for **Worthington Corp.** He succeeds **E. D. Schively** who was placed on special assignment in Canadian operation.

M. L. Backstrom was made assistant district sales manager at Chicago for **Firth Sterling Inc.**, and **C. C. Krogh** was made assistant manager, carbide sales division. Mr. Krogh is also manager, distributor sales division.

Albert P. Gagnebin was made manager and **Harold Larsen** assistant manager, nickel sales department, **International Nickel Co. Inc.**, New York. Mr. Gagnebin succeeds **Ransom Cooper Jr.**, retired.

Korhumel Steel & Aluminum Co. named **Bruce Osborne Jr.** vice president in charge of the Minneapolis operation.

Wendell P. McKown Jr. was elected vice president-manufacturing for **Cooper Alloy Corp.**, Hillside, N. J., and its divisions. **Robert H. Burks Jr.** was made works manager, foundry and aircraft divisions, to succeed Mr. McKown.

Elliott Co., Jeannette, Pa., appointed **H. A. Erb** works manager of its steam division at Jeannette. He was division engineer in the compressor division.

Creed E. Ray Jr. was made supervisor, resistance welding and heat treating departments, **Portland Copper & Tank Works Inc.**, South Portland, Me.

J. S. Peterson was made manager of electronic sales, scale division, **Fairbanks, Morse & Co.**, Chicago.

Leland E. Spencer was appointed vice president of **Goodyear Tire & Rubber Co.**, Akron. He will di-

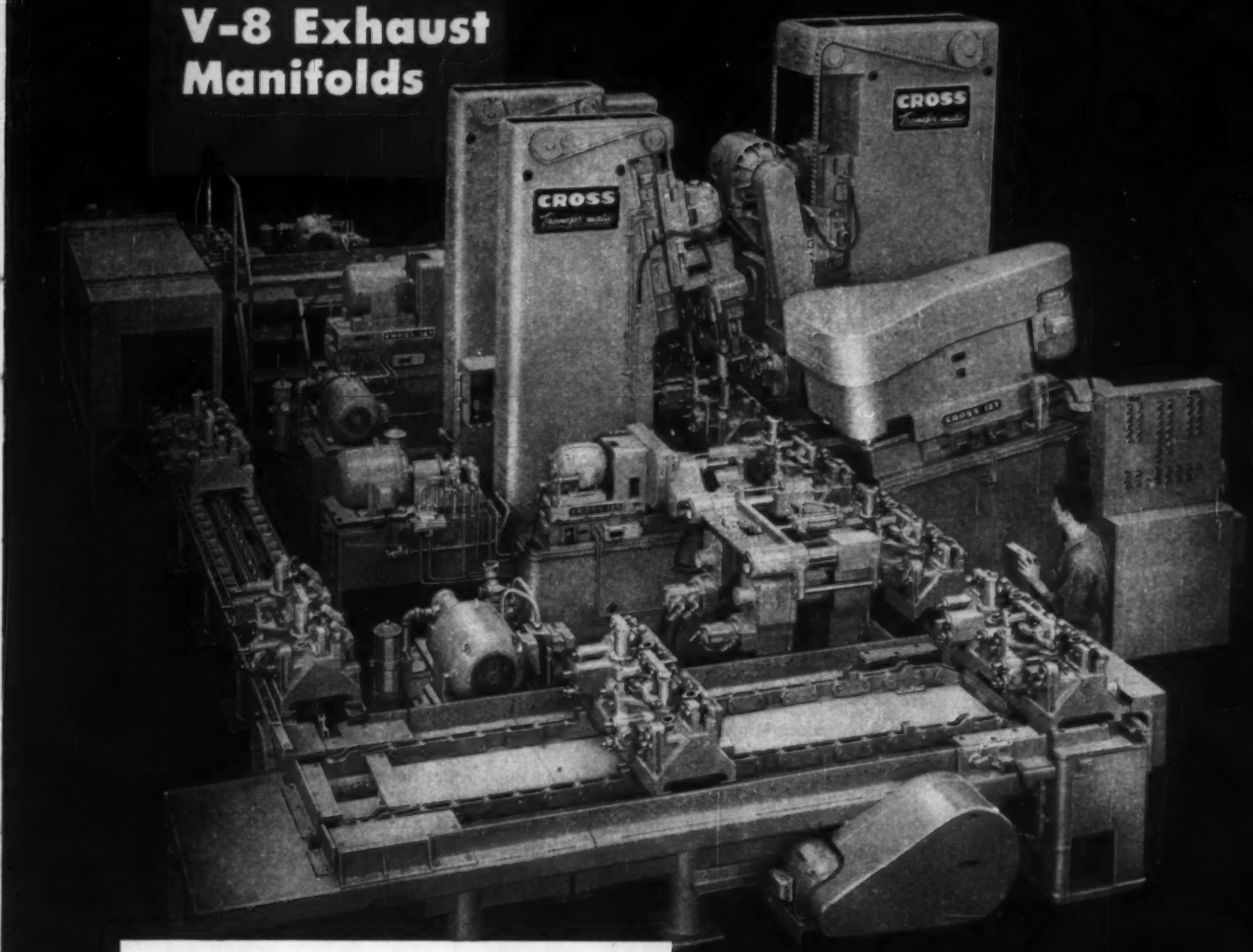
WENDELL P. McKOWN JR.

ROBERT H. BURKS JR.

. . . Cooper Alloy elects vice president and works mgr.

Completely Machines V-8 Exhaust Manifolds

Another Transfer-matic by Cross



- ★ 51 operations: 8 milling; 37 drilling, chamfering and spotfacing; and 6 tapping.
- ★ Palletized work holding fixtures for holding one right hand and one left hand part.
- ★ Automatic power wrench for operating work holding fixtures.
- ★ Automatic transfer mechanism.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.

Established 1898

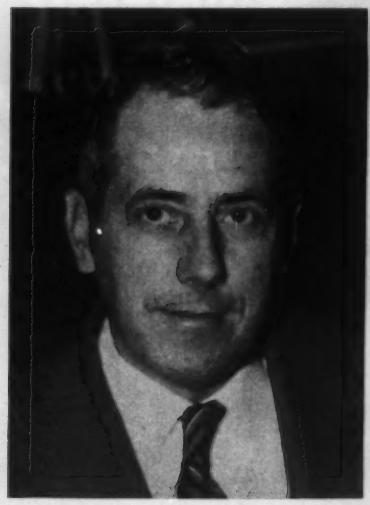
THE CROSS CO.

First in Automation

DETROIT 7, MICHIGAN

A. B. DRASTRUP
. . . Joy Mfg. vice president

J. B. PERKINS
. . . Hill Acme president



LEWIS H. WHITNEY
. . . Whitney Chain president

rect purchasing, general merchandise and material control, rubber plantations and rubber purchasing.

A. B. Drastrup was appointed vice president of **Joy Mfg. Co.**, Pittsburgh. He formerly was president of A. M. Byers Co. **William C. Campbell**, formerly general sales manager and assistant secretary of National Mines Service Co., joins Joy Mfg. as manager of warehouse operations.

Cutler-Hammer Inc., Milwaukee, elected **W. F. Lent** vice president-manufacturing and **R. A. Millermaster** vice president-development. Mr. Lent was works manager, Mr. Millermaster manager of development.

William L. Parcell was named vice president and director of sales, **Ridge Tool Co.**, Elyria, O. He was sales manager.

Hill Acme Co., Cleveland, elected **J. B. Perkins** president to succeed **A. C. McDaniel Sr.**, now chairman. **L. L. Hercik** was made vice president-general manager and **H. W. Sullivan** vice president.

James E. Trask was appointed head of the central machine design department, engineering division, **Minnesota Mining & Mfg. Co.**, St. Paul.

Gerald T. Mitchell was appointed chief engineer for **Vapor Heating Corp.**, Chicago. He was vice president of Bruce Payne & Associates, management engineers.

Marshall H. Boden was made manager of General Motors Corp.'s **Buick-Oldsmobile-Pontiac** assembly plant to be built in Sunnyvale, Calif. He is succeeded as manager of the Linden, N. J., B-O-P plant by **Cornelius P. Blay.**

Lewis H. Whitney was elected president, **Whitney Chain Co.**, Hartford, Conn. He was vice president. **Einar A. Hanson** was elected vice chairman of the board; **Brenniss G. Tyrrell**, executive vice president and treasurer; and **Miss Leota G. MacKenzie**, assistant secretary.

Edward D. Bickford was made an assistant general manager of sales, **Bethlehem Steel Co.**, Bethlehem, Pa. He is succeeded as manager of sales at Cleveland by **C. W. Ganzel** of the Baltimore sales district.

Grant S. Wilcox was named plant manager of **Ross Operating Valve Co.'s** Golden Gate plant in Detroit.

Solar Steel Corp. appointed **T. D. Tuffli** assistant to the president in the California area. He has headquarters in Los Angeles.

OBITUARIES . . .

Merlin W. Denson, general superintendent and vice president of **Shepard Niles Crane & Hoist Corp.**, Montour Falls, N. Y., died Apr. 5.

Pancoast R. Baker, owner of **Baker Mfg. Co.** and **U. S. Lock & Hardware Co.**, Columbia, Pa., and of **Industrial Castings Co.**, Minerstown, Pa., died Apr. 5.

Harry S. Bowen, 64, chairman of the board of **Puget Sound Fabricators Inc.**, Seattle, died.

Stanley C. Boyce, 46, a partner in **Burston Machine Co.**, Toronto, Ont., died Apr. 3.

Richard H. Clark, 49, assistant manager of office sales for **Consolidated Western Steel Division**, U. S. Steel Corp., San Francisco, died Apr. 5.

Earl Sever Sr., 57, owner of **Piqua Steel Co.**, Piqua, O., died Apr. 2.

Guy P. Bible, 74, retired general manager, **Horace T. Potts Co.**, Philadelphia, died in Daytona Beach, Fla., Apr. 4.

E. A. Drott, 69, founder and chairman of **Drott Tractor Co.**, Milwaukee, and president of **Drott Mfg. Corp.**, died Apr. 5.

William H. Bolte, 63, manager of the Doraville, Ga., assembly plant of **General Motors Corp.**, died Apr. 3.

New Kearney & Trecker's "Bull's-Eye" Control Grouping

Available under Tool-Lease program

TF Series milling machine's controls are conveniently grouped up-front where they belong to assure accurate settings ...measurably reduce operator fatigue

ONE look tells why the new TF Series milling machines — Plain, Universal and Vertical — are so easy to operate. "Bull's-eye" up-front control grouping permits operators to achieve exact settings faster, more adeptly and with greater ease than ever before. This "Fron-Trol" convenience is the key to low-cost production . . . because it increases the operator's efficiency and measurably reduces fatigue through elimination of wasted steps.

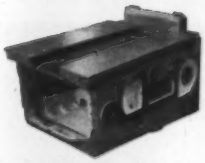
The "bull's-eye" knee and saddle-mounted controls are safety-interlocked and include feed selection, directional Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, front-mounted table handwheel, saddle clamping gib and backlash eliminator and hand and power directional controls for knee and saddle movements.

In addition, the new TF's give you a superior combination of outstanding design and operating features never before available on any other knee-type milling machines. They're built in five sizes — No. 2 to No. 6 from 10hp to 50hp.

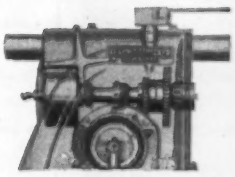
Why take less than the latest when you want new milling machines? You can get all the facts on new TF Series machines from your Kearney & Trecker representative — call him or mail coupon direct to factory today.

A few of many reasons why TF Series milling machines are so easy to operate

Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of new machines' much wider, heavier knee, saddle and table. Balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . halves the wear factor, assuring greater, longer-lasting accuracy.



Heavier, Wider, One-Piece Knee — The TWIN SCREW arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . lasting accuracy . . . substantial reduction of way and gib wear.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, a train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life . . . excellent finish . . . quieter and vibrationless operation.

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

KEARNEY & TRECKER
MILWAUKEE

BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

KEARNEY & TRECKER CORP.
6790 W. National Avenue, Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on new line of TF Series Plain, Universal and Vertical milling machines.

Name.....

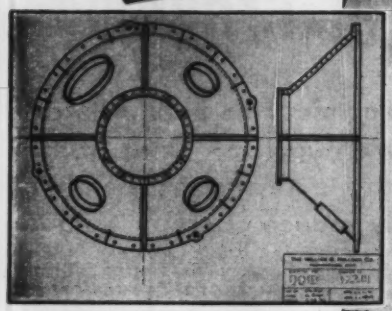
Title.....

Company.....

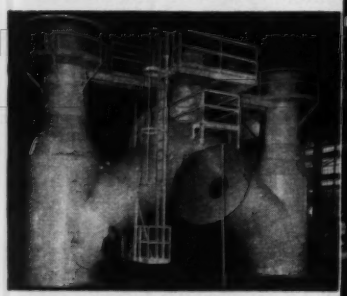
Address.....

City.....Zone.....State.....

POLLOCK

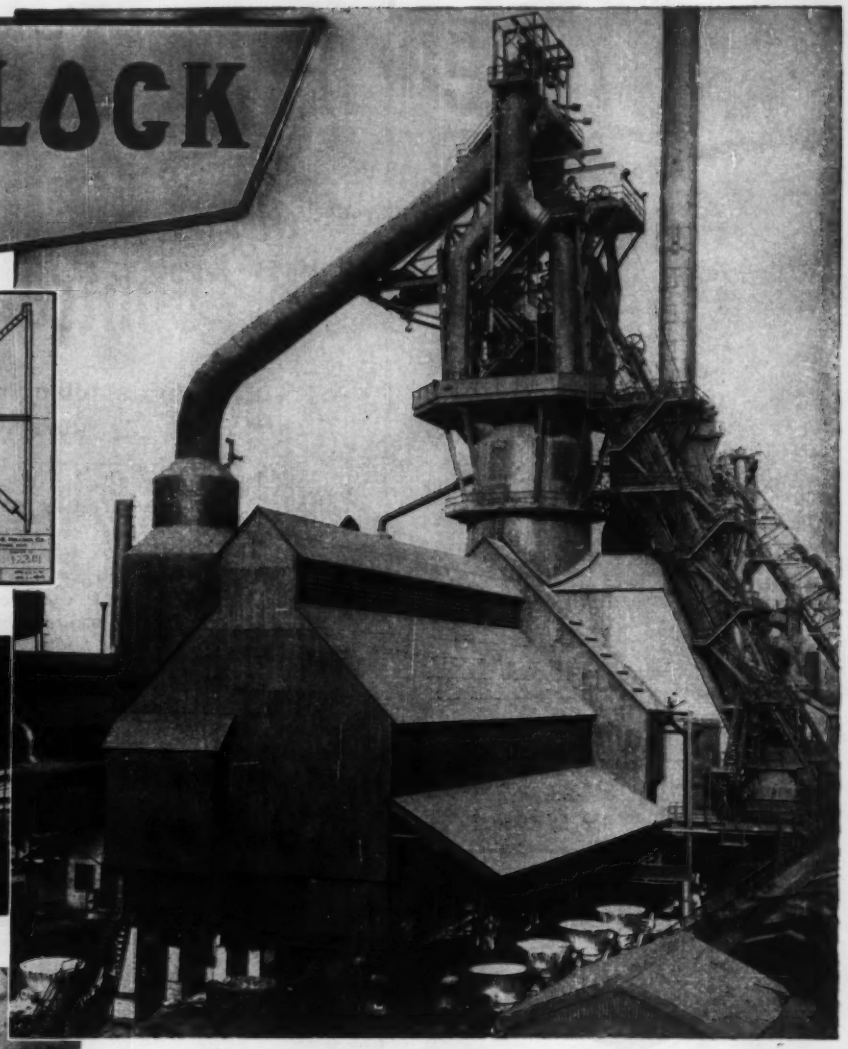


ENGINEERING



SHOP FABRICATION

FIELD ERECTION



Correlating the skills of Pollock engineering, fabrication and field erection to specific operational requirements of The Youngstown Sheet & Tube Company are evidenced in this blast furnace. In addition to furnishing the steel work for this blast furnace, Pollock designed and built auxiliary equipment, including the hot metal ladle cars and cinder cars shown in the above picture. The experience which the Pollock Company has gathered in over eighty-five years is available to you in planning your new projects.

Blast furnace STEEL WORK

POLLOCK

THE WILLIAM B. POLLOCK COMPANY
YOUNGSTOWN - OHIO
STEEL PLATE CONSTRUCTION - ENGINEERS - FABRICATORS - ERECTORS

BLAST FURNACES • HOT METAL CARS AND LADLES • CINDER AND SLAG CARS • INGOT MOULD CARS • CHARGING BOX CARS • WELDED OPEN HEARTH LADLES

New Titanium Firm

Johnston & Funk Titanium Corp. seeks processing improvements through specialization

NEWEST entry in the rapidly expanding titanium industry is Johnston & Funk Titanium Corp., Wooster, O. The firm is producing specialty titanium wire for fabricators of a wide range of products. A grade used for welding is in the line.

The corporation grew out of a partnership which was formed in 1953 by J. H. Johnston and E. R. Funk, with the aid of H. P. Zerrer. Mr. Zerrer is still associated with the enterprise. Early work was devoted primarily to the development and construction of specialized equipment needed for the production of titanium wire. Experimental production of wire continued until this year.

Specialization—The firm is building its production capacity to fit the distinctive needs of titanium. Its officers emphasize that only full-time specialization will result in substantial improvements in processing. Volume pricing will bring about broader application in industry.

Officers are: E. R. Funk, president and treasurer; J. H. Johnston, vice president and chairman; and D. A. Funk, secretary. Buford R. Riffee is plant manager.

Mr. Johnston has published technical reports on metallurgy, welding and titanium. He is vice president of Johnston Stainless Welding Rods Inc., Los Angeles. He formerly was melting and processing research engineer for Mallory-Sharon Titanium Corp., Niles, O., and holds several patents in the titanium field.

Edward Funk has authored numerous technical papers and was formerly chief materials and process engineer at Goodyear Aircraft Corp., Akron.

Tool Plant Gets Kelly Line

Davis Boring Tool Division, Giddings & Lewis Machine Tool Co., has acquired the complete product line of Kelly Reamer Co., Cleveland. Purpose: To provide Kelly users with a source of replacement parts. The Kelly tool inventory will be moved to the Davis plant in Fond du Lac, Wis., where operations will be centralized and tool stocks maintained.

New Mill Makes Extra-Thin Foil

Spider-web-thin sheet aluminum is being produced by Republic Foil & Metal Mills Co., Danbury, Conn. The recently modernized plant can roll aluminum sheets down to a foil 0.00017-in. thick. Five General Electric speed variators help make the uniformly thin gage possible and reduce down time.

Foote Buys Electro Manganese

Foote Mineral Co., Philadelphia, has acquired the assets and business of Electro Manganese Corp. Electro is operating as a division of Foote.

Illinois Zinc, Hayden To Merge

Illinois Zinc Co., Chicago, and Hayden Projects Inc., New York, have reached an agreement on the merger of the two firms. Hayden specializes in the hydrometallurgical treatment of copper scrap, ore and concentrates and the rolling of nonferrous metal products. Illinois Zinc also has acquired a substantial stock interest in Continental Titanium Corp. Continental owns a process for producing pure titanium in ingot form.

Getting Orders by Radio

Two-way radios on tow and lift tractors have been installed at the Waukegan, Ill., Works of American Steel & Wire. Officials believe the dispatch system will boost transportation efficiency and eliminate production bottlenecks

Revere Expands Tube Capacity

Revere Copper & Brass Inc. is launching a $7-million expansion program at its Rome, N. Y., division and the Clinton, Ill., plant, James M. Kennedy, president, announces. The tube mill at Rome will be expanded at a cost of $1 million to enlarge tube output. About $6 million will be spent on facilities at the Clinton plant.

Worthington Opens Welder Lab

A new welding research laboratory has been opened at the Harrison, N. J., division of the Worthington Corp. Covering more than 5000 sq ft of shop space, it will be used for welding application research, designing for welded construction and building prototype models. Facilities also are provided for training programs for welding operators, supervisors and technicians.

Beaver Sets Up New Division

Beaver Pipe Tools Inc., Warren, O., manufacturer of pipe cutting, threading and grooving equipment, recently established an Abrasive Machine Division.

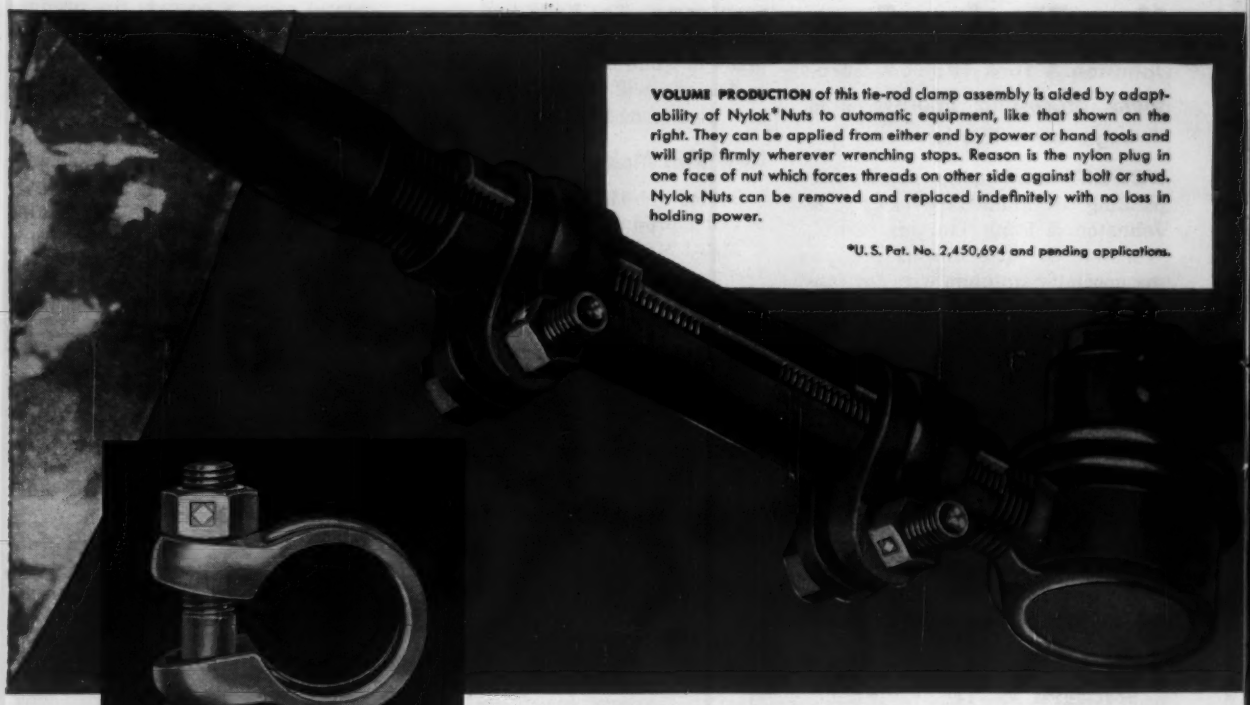
Kaiser Enters Container Field

Kaiser Aluminum & Chemical Corp., Oakland, Calif., has organized a Foil Kraft Division to handle the manufacture and sale of aluminum food containers to the frozen food, bakery and other industries. The new division is in Los Angeles. Alanson L. Brooks is manager.

New Division Established

Loftus Engineering Corp., Pittsburgh, designer and builder of industrial furnaces, expanded its Chicago offices and established a new heat treating furnace and oven division at 140 S. Dearborn St., Chicago. The division will handle sales, engineering and installation of field-erected heat treating and other industrial furnaces, as well as a complete line of standard fur-

(*Please turn to page* 97)

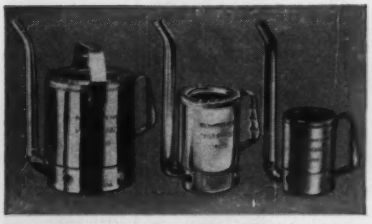


VOLUME PRODUCTION of this tie-rod clamp assembly is aided by adaptability of Nylok* Nuts to automatic equipment, like that shown on the right. They can be applied from either end by power or hand tools and will grip firmly wherever wrenching stops. Reason is the nylon plug in one face of nut which forces threads on other side against bolt or stud. Nylok Nuts can be removed and replaced indefinitely with no loss in holding power.

*U. S. Pat. No. 2,450,694 and pending applications.

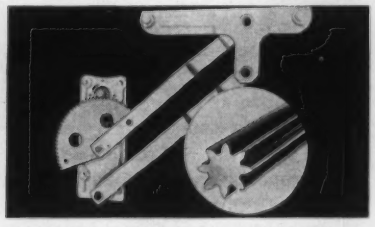
POWERFUL CLAMP ACTION, maintained by Nylok Nuts, keeps vital steering tie-rod assembly securely in adjustment. Republic Nylok Nuts are currently in use on thousands of critical applications subject to shock, vibration and cyclic loading. Clip and mail the coupon for details.

NYLOK NUTS provide positive



FAST PRODUCTION of quality spouts for these oil dispensers is secured by using Republic ELECTRUNITE® Mechanical Tubing. The manufacturer, Swingspout Measure Company, Los Angeles, California, finds ELECTRUNITE easy to swedge and bend as required. Because Republic controls quality from ore to finished tubing, uniform strength, cross-section and ductility are assured. These characteristics underwrite quality in products fabricated from ELECTRUNITE. Send coupon for literature.

ELECTRO PAINTLOK® DOUBLES PRODUCTION of this water cooler manufacturer's painting and drying facilities. How? Because for this particular job Republic Electro Paintlok requires only one pass through paint shop and drying oven instead of two trips needed for uncoated sheets. Also, Electro Paintlok produces a superior finish. Its chemically treated coating actually grips paint . . . and even when scratched, limits corrosion to point of damage. Mail coupon for data.

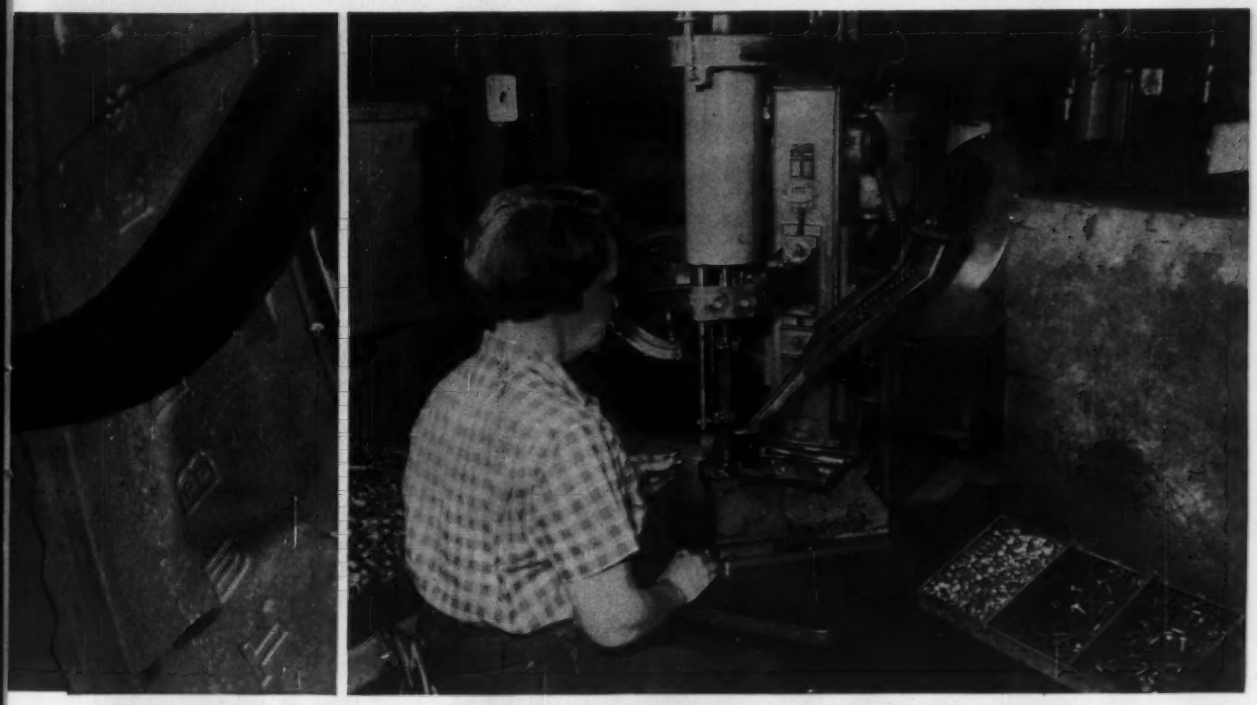


ECONOMICAL, VOLUME PRODUCTION of many parts starts with Republic Cold Drawn Special Sections. For example, the gear shown on this automobile window lift assembly is simply cut from a special section and drilled. In other cases, machining is minimized or eliminated entirely, thanks to fine surface and close tolerance produced by cold drawing. Design to take advantage of special sections and save. For facts, send coupon.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels



SPEED PRODUCTION...

locking and easy adjustment

In line with current emphasis on safety equipment in the automotive industry, engineers are studying every detail to assure maximum operating security. That's one of the reasons why Thompson Products, Inc., Michigan Division, has switched to Nylok Nuts for their steering tie-rod clamp assembly . . . produced for several top automobile manufacturers.

Actually, Thompson has found Nylok Nuts ideal for this application from several standpoints. For instance, they speed production by eliminating handling and assembly of lock washers . . . and since either end is up, Nylok Nuts are ideal for automatic feeding and power wrenching. In addition, they lock tightly even when not seated. Pre-assembled clamps can be freely handled with no possibility of losing the nut or bolt.

Finally, Nylok Nuts retain their grip after any number of tie-rod adjustments. They can be easily backed off with hand tools, and after the adjustment is made, wrenched tight again to stay.

Republic Nylok Nuts have been used in countless applications to speed assembly and provide maximum holding power under all conditions. Why not check your product to see where they will work to advantage for you? For complete information, contact your local Republic Bolt and Chain Division representative, or mail the coupon.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1309
3120 East 45th Street
Cleveland 27, Ohio

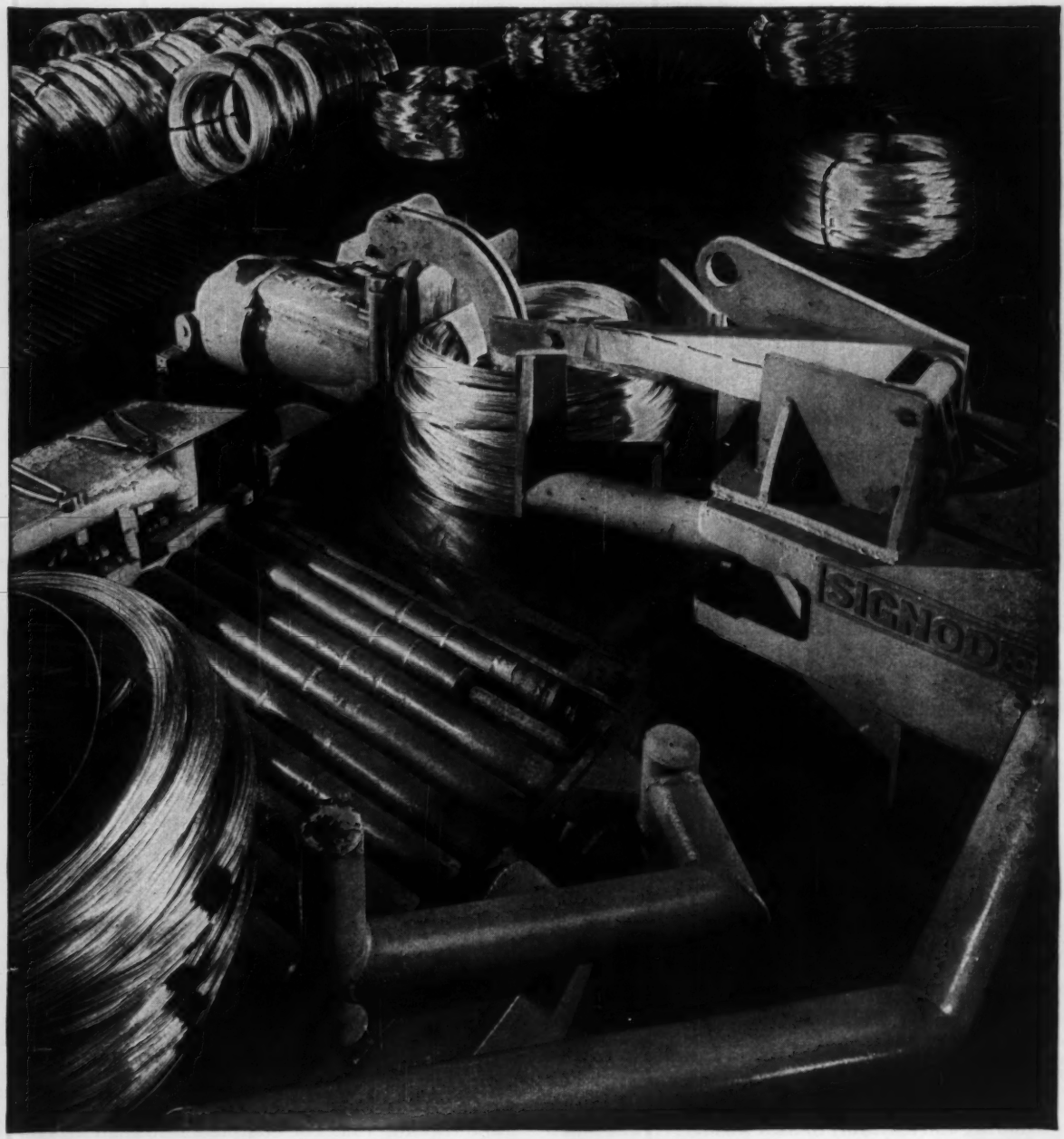
Please send me further data on:
- ☐ Nylok Nuts ☐ Electro Paintlok
- ☐ ELECTRUNITE Mechanical Tubing
- ☐ Cold Finished Special Sections

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____



Strapping can be automatic

This husky Signode machine compresses and straps wire coils automatically. It ties them so tightly that more wire is stored in less space, and coils don't snag or tangle. Other automatic Signode machines bundle pipe and strap packages of many shapes and sizes. For high strength at low cost, you can't beat steel strapping to hold things together or in place. Signode has ways to make your products cost less to handle, store, ship and receive—ways suitable for even the smallest plant. Let a Signode representative show you. No obligation. Just write:

SIGNODE STEEL STRAPPING CO.

2645 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-wide.
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

(*Concluded from page 93*)

naces and ovens. Louis W. Horvath and John D. Joyce will head the division sales and engineering activities.

Refractory Firm Changes Name

Basic Inc. is the new name of Basic Refractories Inc., Cleveland. The new name reflects the corporation's expansion into the manufacture and distribution of building material products and broader markets in the glass and chemical industries. Basic's major function still is the production of refractory material for steelmaking.

New Jersey Zinc Buys Plant

The New Jersey Zinc Co. concluded arrangements for the May 1 acquisition of the American Cyanamid Co.'s plant at Gloucester City, N. J. Plans call for the manufacture of titanium dioxide pigments.

Establishes New Division

Colonial Iron Works Co., Cleveland, is establishing the Bollard Asphalt Plant Division to handle design, sales, manufacture and erection of a complete line of asphalt plants and component units. Arthur W. Bollard, formerly vice president and secretary of F. D. Cummer & Son Co., Cleveland, will be general manager.

Obtains Ohio Machinery Plant

Keegan Steel Fabricating Co., Toledo, O., purchased the former Etna Machine Co. plant, that city, and will use it for the manufacture of machinery.

Awarded Furnace Contract

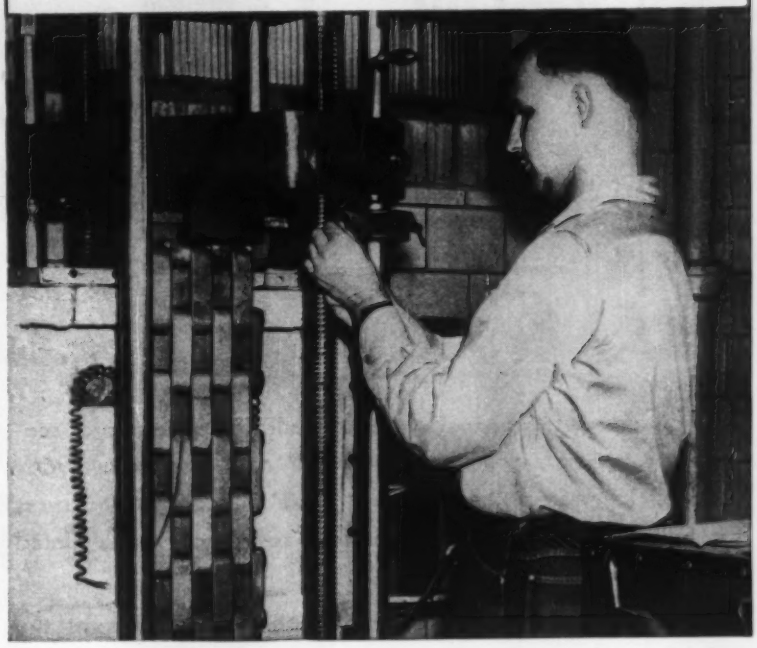
The Gas Machinery Co., Cleveland, has been awarded a contract by U. S. Steel Corp., Pittsburgh, to install a gas-fired heating furnace at the corporation's Johnstown, Pa., Works.

Robertshaw Division Expands

Manufacturing capacity of Bridgeport Thermostat Division of Robertshaw-Fulton Controls Co. will be increased nearly 50 per

THERMALLOY* quality control at work

torture chamber



Up to 30 tons' tension... to test conveyor belt life

In the Electro-Alloys physical laboratory, a Thermalloy conveyor belt is being set up for testing in a hot, tensile test furnace to determine load limits. Tension up to 30 tons can be applied here. This laboratory also carries on Brinell testing, tensile tests as cast, after-aging and stress rupture tests.

Testing of this type in our physical laboratory is just one phase of research and quality control at Electro-Alloys. Our Elyria plant has a completely equipped metallurgical laboratory for study of heat and abrasion problems encountered by our field sales engineers.

Let us put our facilities to work to solve your heat-treat problems—call your local Electro-Alloys representative or write for a copy of booklet T-225. Electro-Alloys Division, 7007 Taylor Street, Elyria, Ohio.

*Reg. U. S. Pat. Off.—designating not just one but a group of alloys—each developed to meet specific heat and abrasion problems.

HEAT-RESISTANT CASTINGS • TRAYS • MUFFLES RETORTS • CONVEYOR BELTS • RADIANT TUBES

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
Elyria, Ohio

ARTIFICIAL SKIN FOR TENDER METALS

Many metals cannot stand exposure to atmosphere, seawater, chemicals or the normal wear and tear of everyday usage. To protect them against these inescapable hazards, metallurgists equip them with a thin, rust-proof, tough plated skin, often ornamental.

Electroplating materials are important products at the Federated Metals Division of American Smelting and Refining Company. Copper, zinc, cadmium and silver anodes of all types and sizes are produced. Well-known Conducta-Core lead anodes, with an extended useful life and superior throwing power were developed by Federated Research.

Federated is also a source of plating chemicals . . . nickel salts and Cadmax and Zimax, new addition agents that make cadmium and zinc plating bright and attractive instead of dull and frosty.

Federated plating materials are available from distributors throughout the United States. Or, if you would like more details on how to get better plating at reasonable cost, write to us directly. Our broad experience with all kinds of non-ferrous metals has made us "Headquarters for Non-ferrous Metals."

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
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In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Federated first in the non-ferrous field FMD

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead, Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

cent when it finishes moving into a new plant in Milford, Conn. The plant has a floor area of about 180,000 sq ft. Dedication ceremonies are planned for some time in June.

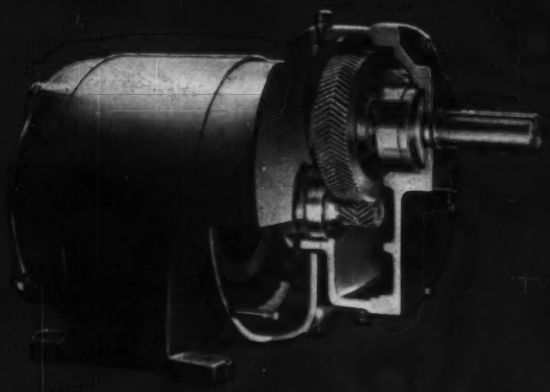
ASSOCIATIONS

American Hot Dip Galvanizers Association Inc., Chicago, elected F. M. Carlson president. He is president of American Tinning & Galvanizing Co., Erie, Pa. Eugene Walker, partner, Green-Walker Galvanizing Co. Inc., New Orleans, was named first vice president; Frank Soles, Delta-Star Electric Division, H. K. Porter Company Inc., Chicago, second vice president. Stuart J. Swensson, Pittsburgh, was elected secretary-treasurer.

C. A. Button of Mueller Brass Co., Port Huron, Mich., was elected president of **National Screw Machine Products Association**, Cleveland. Other officers are: Vice president, D. B. Jefferson Jr., Walker Mfg. Co., Medfield, Mass.; treasurer, L. R. Schaffer, Mechanical Art Works Inc., Newark, N. J. Orrin B. Werntz was re-elected executive vice president, while Margaret S. Ballinger was re-elected secretary.

American Supply & Machinery Manufacturers' Association Inc., Cleveland, elected these officers: President, C. T. Jordan, Charles Parker Co., Meriden, Conn.; first vice president, R. L. Hamilton, Dumore Co., Racine, Wis.; second vice president, L. H. Bellows, Sheldon Machine Co. Inc., Chicago; secretary, F. C. Emerson, Spartan Saw Works Inc., Springfield, Mass.; and treasurer, Lewis Barnard Jr., Lufkin Rule Co., Saginaw, Mich.

Steel Founders' Society of America, Cleveland, elected these officers: President, Howard F. Park Jr., vice president, sales, General Steel Castings Corp., Granite City, Ill.; vice president, G. W. Myers, president, Crucible Steel Casting Co., Milwaukee; treasurer, R. G. Parks, treasurer, National Malleable & Steel Castings Co., Cleveland; executive vice president, F. Kermit Donaldson; tech-



MASTER -1st Choice

for GEARMOTORS

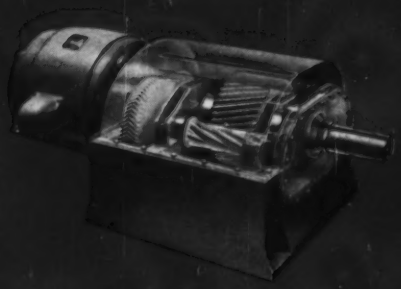
Because...

...With five types of parallel and right angle Gearmotors, Master has the flexibility and choice of design you need for selected output speeds.

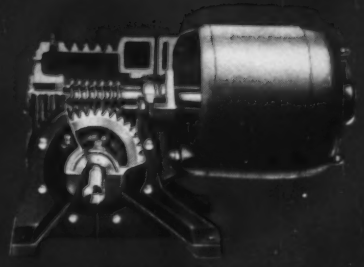
...With electric motor and gears combined into a compact, integral power unit, you reduce costs and increase efficiency through elimination of belts, couplings, chains, sprockets, external bearings or separate reducers.

...Available in sizes from 1/8 to 125 H.P. You can integrate with the gearmotor electric brakes—3 types of variable speed units and fluid drive in any combination.

...And that's why more gearmotors carry the Master name than all other makes combined. Write on your business letterhead for details.



DOUBLE REDUCTION
Parallel Shaft Type

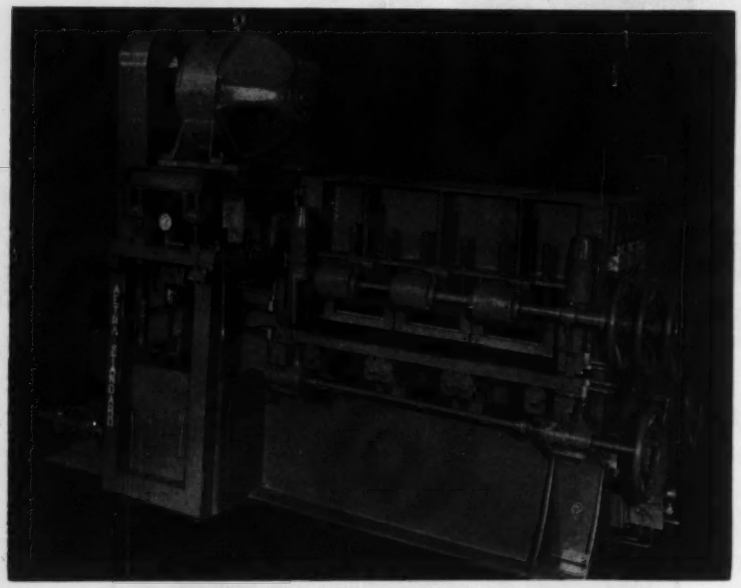


SINGLE REDUCTION
Right Angle Shaft Type

THE MASTER ELECTRIC COMPANY

Dayton 1, Ohio

BEARING TIPS by McGill



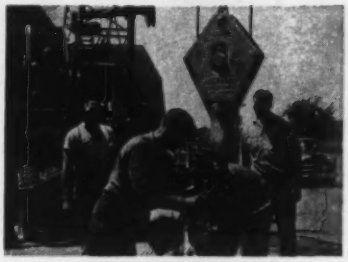
138 GUIDEROL® BEARINGS BACK UP WORK ROLLS IN AETNA STANDARD LEVELER

High load capacity vital to back-up roll support

For processing 16 to 30 gauge steel sheets and coils, this Roller Leveler built by Aetna Standard Engineering Company requires dependable components to deliver a consistent maximum output at speeds up to 400 feet a minute.

McGill GUIDEROL GR-16 bearings were selected for this machine and several larger versions use GR-24 and GR-36 bearings. They can carry the heavy irregular loads associated with flattening and leveling steel sheets and strips. Requiring less radial space, Guiderol bearings provide maximum roll neck diameters and offer greater strength at the necks of larger back-up rollers.

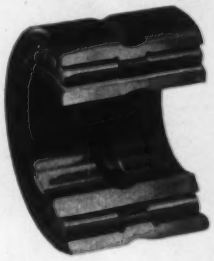
On the machine shown above, there is a total of 36 back-up rollers in 3 upper banks and 33 in 3 lower banks to resist the heavy pressure of the 48 inch working rolls. With a GUIDEROL bearing at each end of the 1¾" back-up rolls, a total of 138 bearings is required for the Leveler. These bearings have proved especially suited to supporting heavy loads longer in small radial space with reduced maintenance and production down time — important in steel mill operations.



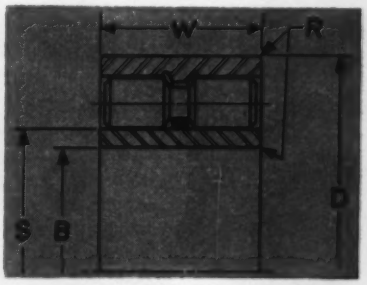
American Hoist Uses CT Series In Crane Blocks

Crane Blocks built by American Hoist and Derrick to withstand the greater strains and rough usage of lifts up to 500 tons rely on the greater capacity of GUIDEROL CT Series bearings in the sheaves. Interchangeable with retainer type cylindrical roller bearings, the CT Series full type roller construction has added capacity of over 38%. In sheaves these bearings offer greater angular stability with full race width rollers. Center guiding without retainer keeps these rollers aligned and prevents binding under eccentric loads.

Center-Guided Rollers Eliminate Load Wasting Cages



Guiderol Bearings inherently possess exceptionally high radial load capacity due to their full complement of small diameter rollers. Grooved rollers and a center guide rail keep rollers aligned as insurance against skewing and binding that is possible with ordinary needle bearings. Sizes interchange with needle and cylindrical roller bearings.



CT Series Adds Guided Roller Advantages to Cylindrical Roller and Ball Bearing Sizes

CT Series Guiderol Bearings provide the load carrying advantages of center guided rollers in cylindrical roller and ball bearing sizes. They are interchangeable in both single and double row dimensions. Inner rings are separable and may be eliminated to reduce radial space.

140 Pages of Bearing Facts

Write for your copy of Catalog No. 52, a revised 140-page Bearing Selection Guide. It contains vital product information and 30 pages of engineering data.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL
Full Type Roller Bearings

McGILL MANUFACTURING COMPANY, INC., 301 N. LAFAYETTE ST., VALPARAISO, INDIANA

nical and research director, Charles W. Briggs; secretary, G. K. Dreher.

L. F. Yerges, U. S. Gypsum Co., Chicago, was elected president of **Acoustical Materials Association,** that city. Paul J. Washburn, Johns Manville Sales Corp., New York, was elected vice president; Wallace Waterfall, secretary-treasurer.

Morris Boorky was re-elected president of the **Metal Powder Association,** New York. Mr. Boorky, president of Presmet Corp., Worcester, Mass., was also elected chairman of the board. Lewis Davis, Metal Hydrides Inc., Beverly, Mass., was elected first vice president. Chairmen of divisions who also serve as vice presidents are: E. H. Klein, New Jersey Zinc Co., New York, Powder Producers Division; Richard Ponemon, Pyroferric Co. Inc., New York, Iron Powder Core Division; T. L. Robinson, Powdercraft Corp., Spartanburg, S. C., Fabricators Division; D. L. Almquist, Stackpole Carbon Co., St. Marys, Pa., Ferrite Division.

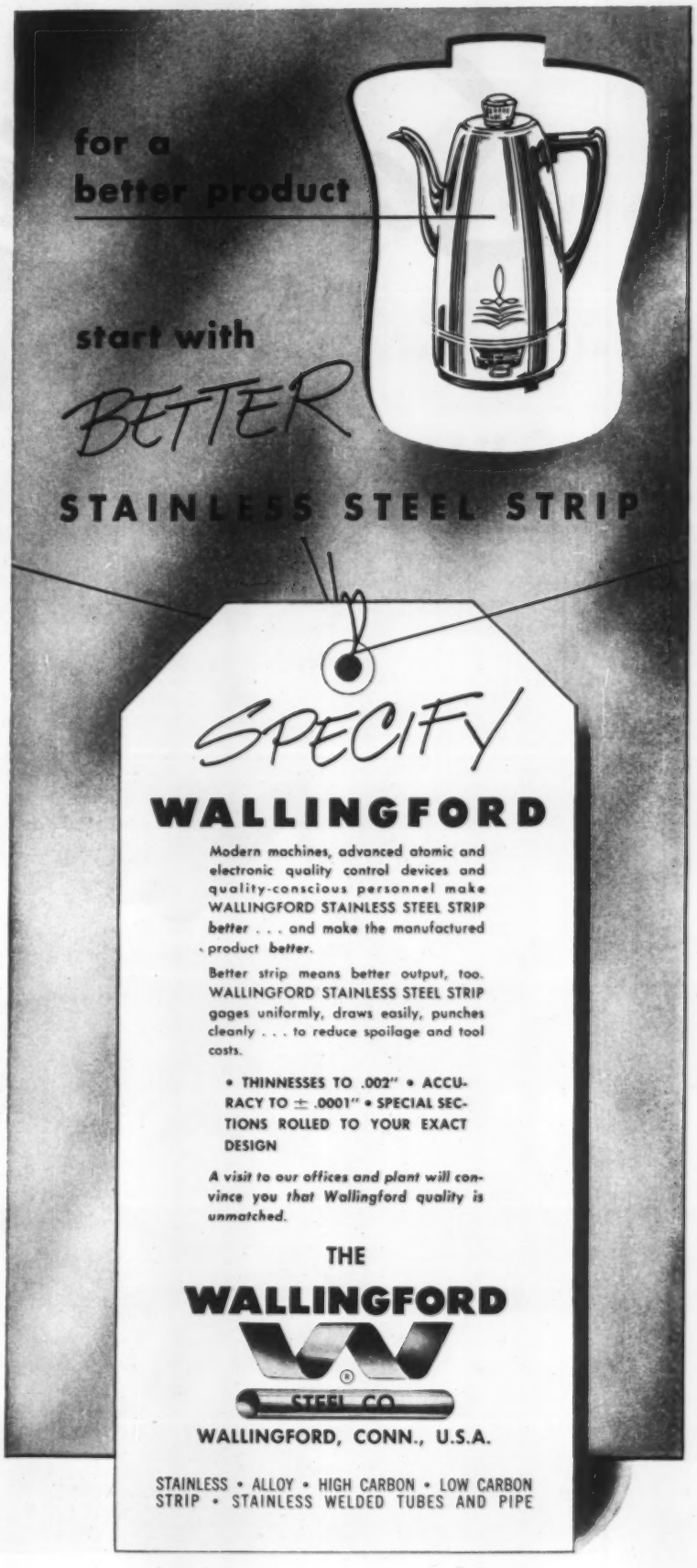
REPRESENTATIVES

Yale Materials Handling Division, **Yale & Towne Mfg. Co.,** Philadelphia, appointed Garnett A. Vining as western regional sales manager. Vining will have supervisory control of activities in 11 western states and northwestern Canada.

NEW ADDRESSES

Grip Nut Co. moved its Chicago sales offices to larger quarters in its main plant at South Whitley, Ind.

All west coast activities of **Bellows Co.,** Akron, are consolidated in a building at 926 Western Ave., Glendale, Calif. The new building will serve as headquarters for the Bellows Co. of California and the Smith Johnson Mfg. Division of the parent company, maker of air cylinders and other pneumatic work devices.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better product
start with
BETTER
STAINLESS STEEL STRIP
SPECIFY
WALLINGFORD
Modern machines, advanced atomic and electronic quality control devices and quality-conscious personnel make WALLINGFORD STAINLESS STEEL STRIP better . . . and make the manufactured product better.
Better strip means better output, too. WALLINGFORD STAINLESS STEEL STRIP gages uniformly, draws easily, punches cleanly . . . to reduce spoilage and tool costs.
• THINNESSES TO .002" • ACCURACY TO ± .0001" • SPECIAL SECTIONS ROLLED TO YOUR EXACT DESIGN
A visit to our offices and plant will convince you that Wallingford quality is unmatched.
THE
WALLINGFORD
STEEL CO.
WALLINGFORD, CONN., U.S.A.
STAINLESS • ALLOY • HIGH CARBON • LOW CARBON
STRIP • STAINLESS WELDED TUBES AND PIPE

Something more

than machining...

the most decisive factor of accuracy in a Hendey Tool and Gage-Makers' Lathe

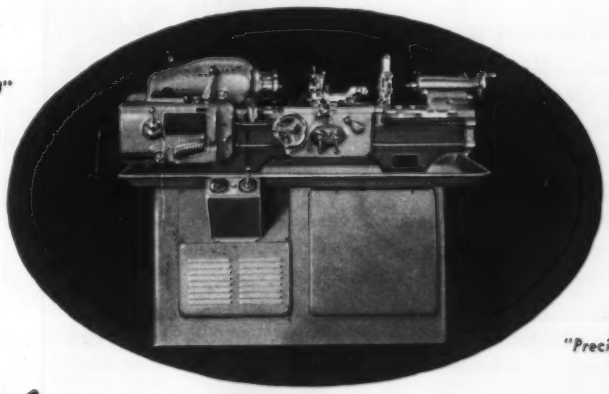
Pictured here is one of the many determining steps in the process of building a toolmakers' machine tool — the point at which craftsmanship takes over after the finest available machines and methods have done their job.

After precision grinding all of the way surfaces on a Hendey 9" Tool and Gage-Makers' Lathe, the operator uses this special fixture to check relative alignment and accuracy. "Tenth" indicators are first set by mounting the fixture on a "master." The "master," itself, has been hand scraped until its ways are within .0002 in. of each other and any other surface. Skillful use of the fixture permits the operator to hold straightness and parallelism of the hardened ways within precision tolerances.

This lathe can be equipped with either a magnetic amplifier or an electronic drive unit. Either of these drives makes turning easier than ever before. They give you a wide range of stepless speeds and close control of speeds, which can be changed smoothly and easily even under load. Production is speeded by a dynamic brake, which allows rapid stopping of the spindle. You can start, stop, and reverse the spindle from pre-set speeds smoothly and quickly . . . and brake maintenance is eliminated.

These are only a few of the reasons this toolroom lathe can help you improve accuracy, increase production, and reduce turning costs. Your Hendey dealer is ready to give you the complete story.

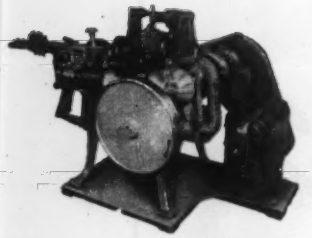
Hendey 9" x 24" Tool and Gage-Makers' Lathe



"Precision with Production"

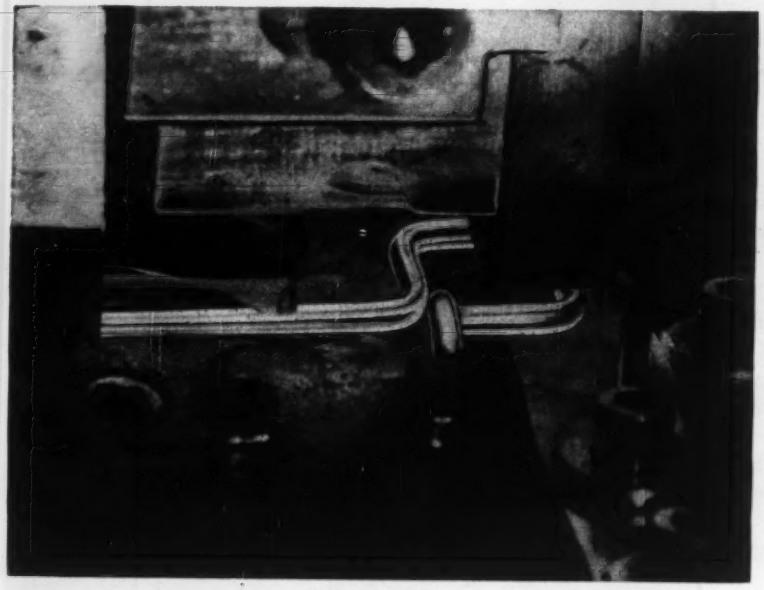
Hendey machine division
BARBER-COLMAN COMPANY
49 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN ®



NILSON 4-SLIDES PAY OFF 4 WAYS

• BIG PROFITS • BIG PRODUCTION
• BIG SAVINGS • BIG GAIN IN ACCURACY



Forming Operation: Meter Shunts of 3/16" Wire Stock

WHY NILSON IS TOPS FOR 4-SLIDES:

Nilson 4-Slides are built for rugged duty
Form both ribbon metal and wire stock
Press capacities 8 to 75 tons, wire diameter to ½"

16 Models Available, Including Combinations of Horizontal Press and 4-Slide

YOU PROFIT BY: Automatic Operation • Increased Production • No Secondary Handling • Improved Products • Fewer Rejects • Lowest Initial Cost

Nilson engineers are always available for consultation on forming problems. Bulletin #61 sent on request.

Nilson's 3 tilt and 3 stationary reels handle wire or ribbon stock coils up to 500 pounds.

A.H. NILSON MACHINE COMPANY

1512 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

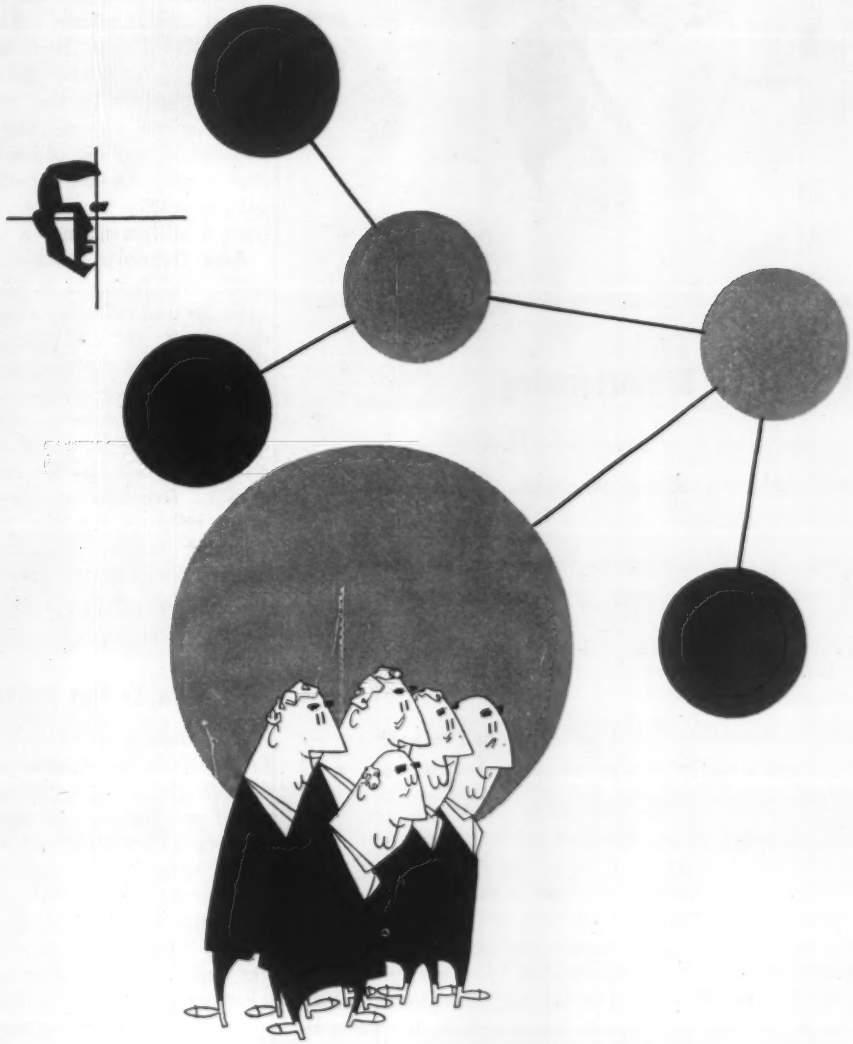
3

STEEL's 1956 Management Series . . .

The editors of STEEL herewith present the third in their ten-part series, Program for Management for 1956. The complete list:

1. **It's Time To Grow** (Feb. 13, p. 81)
2. **Know Your Costs** (Mar. 19, p. 83)
3. **Ideas for Industry** (Apr. 23, p. 105)
4. **Metalworking Goes to Market** (May 14)
5. **Metalworking's New Horizons** (June 18)
6. **How To Live with SUB** (July 16)
7. **To Merge or Not To Merge** (Aug. 13)
8. **Motivating Men To Produce** (Sept. 24)
9. **Automation—Bogeyman or Bonanza** (Oct. 15)
10. **Industry and College—Partners in Development** (Nov. 12)

• *An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, O.*



Ideas for Industry...

DO you know that the people in your company have 50 to 75 bright ideas on almost any of your business problems?

That you can unlock this treasure with a new technique called brainstorming?

That the discipline converts a noncreative conference into an idea-generating session?

That as a by-product you can improve human relations among your people 100 per cent?

By Any Name—Scores of metalworking companies are using the technique. Psychologists call it "group ideation." Whatever you call it, it provides a way to put creative imagination to work.

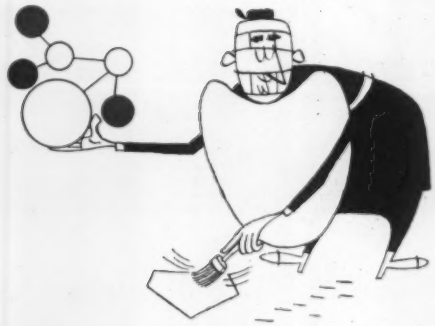
It is one solution to the self-criticism of the business executive: That he tends to think in terms of past problems and past solutions. Here is a new approach.

Benefits—Brainstorming excites metalworking managers and those who want to become managers. It provides a way to do a better job for the organization, to make it more efficient, more progressive.

It opens a door through which the individual may improve his status. Brainstorming helps the president look better to his board of directors. It helps the manager to appear in a better light before his president and the supervisor to look more alert to his manager. And the worker can better impress his supervisor.

Try It

Brainstorming is like a bull session with a purpose. Form a panel



Ground Rules for Brainstorming

1. Set brainstorming sessions apart from other conferences
2. Outlaw criticism and evaluation during the session. Judgment comes later
3. Welcome "freewheeling" in idea suggestion: The wilder, the better. An idea that sounds ridiculous may spark another that is practical
4. Seek quantity, not quality. The more you fish, the better your chances of landing some "big ones"
5. Encourage hitchhiking. Each panelist should be encouraged to point out how suggestions by others can be sharpened up, or how two or more ideas can be combined into a still better one

of eight or ten persons near parity in status. Pose a specific problem. Encourage panelists to let themselves go and give voice to any idea that comes to mind, or to improve upon ideas offered by others. Outlaw criticism and evaluation.

You'll be amazed by the results. Par is about 60 ideas for a 10-or-15-minute session.

Crackpot & Crackerjack—Some will be wild and worthless. Some will have merit. Some will be brilliant.

Some of the terrific ideas wouldn't even be advanced in the ordinary conference because of the originator's fear of criticism.

Brainstorming is a mental exercise. It develops the imaginative approach to problems. Harold Schmidhauser of the American Management Association says it removes inhibitions just as a plunger opens a stopped-up sink.

Panelists tend to carry the positive approach so necessary to brainstorming to other problems. Creative thinking becomes a habit.

Saves Dollars — A midwestern appliance manufacturer figured he needed a $200,000 conveyor to help boost production. The shop foreman and some of his men got their heads together on the problem during their lunch period. (They had been studying brainstorming in a company-sponsored class.) Result: An idea to modify the plant's material handling system so it could take on the additional load. Cost: $4000. Saving: $196,000.

Next Plateau—The president of a large electrical manufacturing company found himself involved in an extremely embarrassing and potentially costly situation with one of his utility customers. He couldn't come up with an acceptable out. Neither could his vice presidents. Someone suggested in desperation: "Let's send it through a brainstorming panel."

A middle-management panel attacked the problem. Thirty-five minutes later it had 96 ideas. Seven were considered good enough for submission to the boss. The one selected offered the harried president a way out of his dilemma, plus a way to increase the company's utility business by more than a million dollars a year.

Alex Osborn's Child—The technique first flowered in advertising agencies and colleges. Alex Osborn, co-founder of Batten, Barton, Durstine & Osborn, generally is regarded as its father. He has been using brainstorming since 1939 and is one of its strongest advocates. He is the author of *Applied Imagination* (Scribner's), often used as the No. 1 text in teaching creative thinking in industry. Many others are contributing to the development of the technique.

How To Get Started

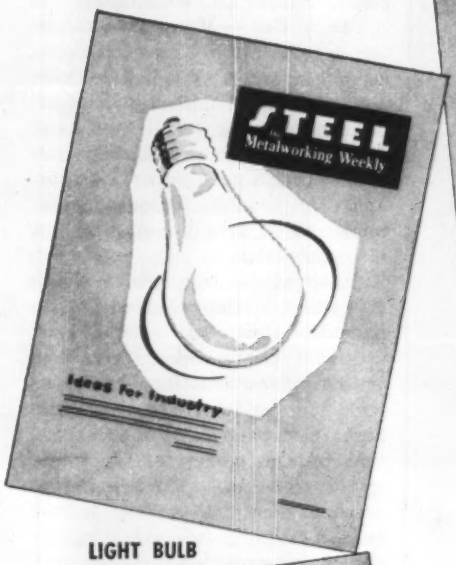
The best way to evaluate the technique is to organize your own session.

All you need is a small group of people, preferably of about the same status, who are willing to experiment, a meeting room, an understanding of the "ground rules" (above, left) and a problem that can be reduced to a specific question.

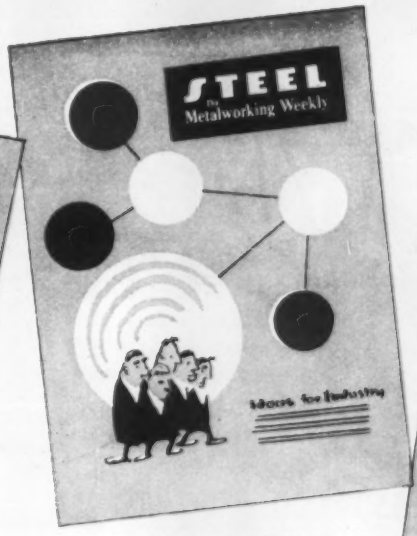
Explain the ground rules to the panelists and insist that they be followed. Pose the problem and let the ideas roll forth.

Moderators can throw thinking into high gear by starting the session with a frivolous suggestion. It sets the proper mood. Top-of-the-head ideas may be frowned on in other conferences, but in brainstorming they often trigger a practical solution.

Example—George Welch of General Electric likes this story: "Suppose you are a member of the crew of a destroyer riding at anchor off the Alaskan coast. A heavy swell is coming in from the northwest. It is foggy. Suddenly, the lookout sights a loose mine bearing down on the destroyer. There isn't time to hoist anchor and get out of its path. And the mine is too



LIGHT BULB



CHAIN REACTION

PANEL AT WORK

POPPING FIRECRACKERS

PINWHEEL

STEEL Brainstorms a Cover

The editors and artists of this magazine have a problem made to order for brainstorming—the production of our editorial front covers.

Each cover is designed to communicate graphically the idea behind a leading article.

For this issue's cover, the problem was stated:

"Ideas for Industry—Through Creative Thinking

"A method by which imagination can be more productively utilized is winning enthusiastic acceptance in industry. It is called creative thinking. Its No. 1 technique: Brainstorming, or using the mind to storm a problem in commando fashion, with each member of panel audaciously attacking the same objective. It is disciplined creativity. It is group ideation. It utilizes mental chain reactions. How can we graphically communicate the idea to our readers?"

That statement of the problem was distributed to the panel (five editors, four artists and a promotion man) two days before it convened.

On the appointed day, the brainstorming produced 67 ideas in 10 minutes. Some were wild and useless. Some were whimsical but suggested practical ideas.

Following the session, the ideas, which were recorded on tape, were evaluated by the editor and art director.

Five were selected as possibilities. Artists made roughs, shown in miniature on this page. Editors and artists agreed that the chain reaction best communicated the idea, although minority votes were cast.

Which do you prefer?

Going for $500,000

Three million speakers for radio and television sets are purchased each year by Motorola Inc., Chicago. Each was tested by ear for frequency range, sound output and uniformity. Inspection, which was necessarily slow, required a lot of technical talent.

Gus Mydill, director of incoming quality control, is an enthusiastic advocate of brainstorming. The test for speakers seemed to be a natural for the technique. At a dinner session, Mr. Mydill and his aides brainstormed the problem. Many solutions were suggested. The one adopted: Visual inspection.

Bud Pelletier, the chief inspector at the Franklin Park plant, suggested the new test. He, Mr. Mydill and other associates rigged it up. Now the inspector watches electronic signals on an oscilloscope. He is guided by go-no go gage lines.

Results are: The elimination of human error; a 25-per-cent saving in testing salaries; and a 50-per-cent saving in space requirements (the sound booth for the ear test is no longer needed).

Motorola's incoming quality control force has produced other money-saving ideas. Some are believed patentable, and, of course, the company isn't talking about them.

Gus Mydill's goal for his group's brainstorming: $500,000 savings for Motorola in 1956.

close to be detonated with a salvo from the deck guns. What to do?

"The commander musters the crew and asks for suggestions. A wag pipes up: 'Let's get the crew on this side and blow the mine back to the sea.' Apparently a foolish suggestion, it rings a bell in the commander's mind (the principle of hydraulics is involved). 'Get out the fire hoses,' he orders. A powerful stream of water holds the mine away from the ship until the anchor can be lifted and the destroyer steams out of the mine's path."

Self-Feeding—Brainstorming becomes a self-developing technique. Experience will help the moderator find ways to encourage the timid to contribute more ideas. Each group tends to develop its own gimmicks to prime the creative process.

Some device will be necessary to enforce ground rules. The moderator must at all times guard against criticism or adjudication during the session. A panel never becomes convinced it should not be permitted to evaluate a little. But in brainstorming, a little bit of evaluating is like a little bit of poison ivy. It tends to spread. It puts a damper on idea making.

Use a Bell—Many moderators use a bell to warn panelists who are out of order. The bell becomes recognized as a symbol and is less offensive than a verbal reprimand by the moderator. Bell ringing is received with good natured humor, and, as panelists become accustomed to it, it will not interrupt idea generation.

Other moderators prefer a red disc which is flopped over when a panelists violates a ground rule.

Should the panelist persist in criticizing or evaluating, the moderator may be forced to reprimand him. One persistent offender was told by the moderator to "think up or shut up." Once a person demonstrates he cannot refrain from criticizing or evaluating, he should be excluded. Maybe he'll be valuable on the evaluation team which takes over later.

The signaling device also may help the moderator when panelists preface suggestions with too much "sell." Selling, like criticism, can bog down the session. At best, it wastes a lot of time.

Relax—An informal atmosphere is essential. It's a shirt-sleeve-type session. Coffee and/or food often helps. A few laughs should be encouraged.

But the objective must be kept in mind by all. Sometimes a panelist is tempted to show off his wit and get everyone way off the beam. It's up to the moderator to discourage overindulgence in humor and to keep the objective in focus.

Watch for Fatigue—Brainstorming requires a high degree of concentration. When panelists tire, idea creation slows down—a cue for the moderator to call an intermission. There can be no set rules here. Some sessions may continue for an hour or more before any signs of fatigue appear.

Stating the Problem

Whether your problem is one of production, engineering, marketing or administration, it is susceptible to brainstorming if you reduce it to a specific question. The problem should be stated simply and clearly. It should not indicate a conclusion. Be careful in phrasing the objective so that the brainstormers

can shoot their ideas at a single target.

Be Brief—State the problem as briefly as possible. Too many facts stifle the spontaneity so necessary to successful brainstorming. A statement that is too long is likely to introduce can'ts, musts, don'ts and other sacred cows.

The purpose of the statement is to establish the framework within which all thought can be directed.

Slice It Down—Attack only one problem at a time. Multiple targets are impossible to hit.

Several publishers tried to brainstorm ideas for a conference they were planning. The statement was: "How shall we set up this conference?" They started with the subject matter of the conference, and a few ideas were offered. Then someone suggested the site. Someone else came up with an idea about the guest list. That prompted someone else to talk about speakers. Ideas were fired in all directions. The session was a flop.

Remedial action was taken. The problem was subdivided into four parts: Subject, site, guests and speakers. Each item was brainstormed separately. In 45 minutes, panelists generated more than 200 ideas for the conference.

Preparation — A written statement of the problem should go to each member at least 48 hours before the session. This will give panelists a chance to familiarize themselves with the subject and orient their thinking.

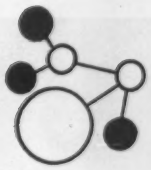
Recording the Ideas

Ideas pop like a string of Chinese firecrackers. One sets off another, which, in turn, touches off three more.

Ideas tend to tramp on each other's heels. Keeping track of them is somewhat of a problem. Mr. Schmidhauser of AMA likes to use a panelist as the idea collector. He writes the ideas on a blackboard where they can be visualized. This encourages improvement and combination.

If a secretary or stenographer is used, she will want to take down the ideas in reportorial style rather than verbatim. Even so, she'll have to be fast.

A tape recorder will pick up all



How To Bust a Bottleneck

In Hotpoint Co. Inc.'s range department, three overhead conveyors brought the range body, top and oven door to the assembly line. The company had to increase production. Space was limited. How could it deliver more parts to the assembly line?

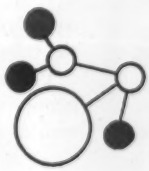
A brainstorming session brought forth scores of ideas. The winner: Devise a new hook capable of carrying the three parts on one conveyor. Treble hooks were installed on all three conveyors. Deliveries to the assembly line increased threefold.

Need a Name?

When Easy Washer Corp. developed its combination washer and dryer, it needed a name for the machine. Batten, Barton, Durstine & Osborn Inc., its advertising agency, brainstormed the problem. The panel came up with 993 unduplicated suggestions.

Selling Colored Telephones

For the New York Telephone Co., the same advertising agency set up a brainstorming session on how to merchandise the company's new colored telephone sets. The panel came up with 82 ideas. Eighteen are being used to sell Gothamites the fancier product.



Ideas from the Garbage Can

Arthur C. Studt, manager of education and training for Hotpoint Co. Inc., tells his people to "go to the garbage can" for their practice problems on brainstorming. Finding what is being thrown out, then tracing it back to the operation responsible for the scrap offers a chance to eliminate a loss.

One of the student brainstormers came back with some little paper tubes. Vendors used them to package small bellows which go into Hotpoint thermostats. The company was throwing away 13,000 a week.

Mr. Studt's panel started brainstorming the problem: "How can we utilize these tubes?"

A panel member asked for a recess and came back with a basket of corks which another vendor uses to seal metal tubes for the company's washer. The corks fitted the paper tubes.

Hotpoint now uses the paper tubes, closed with scrap corks, to package spare fasteners supplied with all new ranges.

Stainless steel radiator grille and air scoops studied as . . .

Studebaker Brainstorms New Models

The Studebaker-Packard merger in October, 1954, and the attention devoted to the marriage ceremony made especially difficult the readying of a new line of cars for the following year. Time was short. Money was limited.

How the Studebaker side of the family came up with two distinct products—the Hawks and the regular line—is a testimonial for brainstorming.

Roger E. Bremer, vice president for purchasing and product planning, and ten of his aides got together in a little red building near Mt. Clemens, Mich., and brainstormed the new series into being.

Objective No. 1: To produce a series to appeal to the mass market and to compete with the Big Three.

Objective No. 2: To design a sports car to appeal to the buyer who wants a car that looks "different."

In both cases, the brainstormers were trying to produce the biggest package for the least money and to make up time lost during the nuptials.

Evenings and week ends were spent brainstorming. Thousands of ideas were forwarded.

Translating rough designs into a production model was accomplished in four months. Usually, it takes a year. Only 11 months elapsed before new models were introduced in November, 1955. Ordinarily, the job takes 36 months.

Typical of the time and money saving ideas: The group wanted high rear fender fins. New tooling would cost $500,000. Delivery would take months. So the brainstormers decided to try Fiberglas fins fastened to the steel fender. Tooling cost: $32,000.

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the ideas, and a transcription provides a complete record for evaluation.

Doubling Up — Using both an idea collector and a secretary or recorder combines the advantages of visual stimulation and a complete record for evaluation.

More Ideas—On the day following the session have the idea collector or moderator canvass panel members to collect afterthoughts, ideas which incubated overnight.

Evaluating the Ideas

Ideas collected during the brainstorming session are like a load of unthreshed wheat: More straw and chaff than grain.

The next operation, evaluation, is the separation of the chaff from the grain. It is an essential step of the harvest, but always must be kept separate from the gathering in of the sheaves.

Evaluation usually is done by people who were not members of the panel.

Now is the appropriate time for judgment and criticism. Those qualities should be combined with a high degree of objectivity and a

Blacksmiths, engine hostlers, electricians and apprentices help as . . .

Shop Brainstorming Saves C&O Millions

Let your shopmen in on brainstorming. They'll participate eagerly. They may come up with big cost-cutting ideas. And the potential for improving labor relations is limitless.

Thirty months ago the Chesapeake & Ohio Railway faced the problem of converting its Huntington, W. Va., shops from steam locomotive repair to a diesel shop. C&O brass figured the planning job would take about three years and that the project would cost nearly $15 million.

The workers were impatient to get going. They started their own brainstorming sessions during the lunch hour. Electricians, engine hostlers, blacksmiths, carpenters and apprentices tossed in their ideas on how to rearrange the 11-acre facility. Here were men familiar with the problems and men who would operate in the new layout.

E. E. Slack, supervisor, listened and took notes. A draftsman put the ideas on paper. Sixty workers contributed.

After collecting a vast number of ideas, the workers got down to cases and built the scale model, shown above.

The model was shown to C&O directors who unanimously approved the plan and appropriated the money to finance the conversion.

Time required: Six weeks, against the original estimate of 30 to 36 months. Cost: Around $2.5 million, against the original estimate of $10 million to $15 million. Another benefit: A work force that is enthusiastically co-operative with management.

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willingness to consider and test that which is new.

Testing — The evaluating team usually picks those ideas which appear to hold the most promise of being workable. They may select several, from six to ten or more. The ideas are checked for practicality, costs and may be field tested.

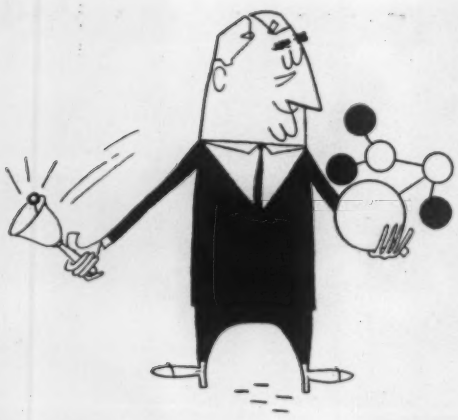
Eventually, they go to the boss for the final word.

Following Through

After brainstorming and evaluation, you should come up with one or more workable ways to solve your problem. But this is not the end. An idea isn't worth much if it just goes into someone's file.

In some metalworking companies checked by the editors, some brilliant ideas were being produced. Many were dying on the vine because of imperfect communications through the management channels.

While that situation does not indicate any weakness in the technique, it is sometimes frustrating to its advocates. They realize the assignment is not completed until you have some tangible result. Or, as one training director puts it, until you have something you can



How To Plan and Run a Brainstorming Session

1. Ten to twelve people make an effective panel. Pick a group that is relatively homogeneous in status. Shut the door to the boss. His presence dampens spontaneity, discourages freewheeling
2. Reduce the problem to a written statement. Use simple terms. Avoid indicating a solution. If it can be stated as a "how to" problem, that's good
3. Send each panel member a statement of the problem at least 48 hours before the session
4. Let the moderator set the pace with a freewheeling idea
5. Use bell or similar device to warn those who criticize, evaluate or adjudicate. It will become recognized as a symbol and will be less offensive than a verbal reprimand by the moderator
6. Record all ideas. Use a member as an idea collector, or a stenographer or a tape recorder. If necessary, have a transcript made
7. Watch out for attempts by panelists to sell their ideas. You'll lose quantity. Ring the bell
8. Watch out for self-styled comedians. They can sidetrack the thinking of others. Ring the bell
9. Watch for signs of fatigue. When panelists begin to tire, call an intermission
10. Make the atmosphere informal. Panelists work best when seated around a table. Be sure to have good ventilation, plenty of ash trays, but no pencils or paper to tempt note taking or making. Sometimes coffee and/or food helps
11. Follow through. Call panelists the following day to pick up afterthoughts. Always let panelists know the results of the session and what action was taken

sell to the public for money.

Where problems have been brainstormed by the men who are in a position to put the ideas into action, the results often have been sensationally successful. Where the problems have been brainstormed "upstairs," the results often have been less successful.

Better Human Relations

An important, and sometimes surprising, by-product of brainstorming is improved relations among the participants. Many companies report a better understanding of personalities among panel members.

A New Jersey metalworking company was having a lot of difficulty in one of its major departments. Management appointed a new department head who had established a reputation for getting along with people. He found that bitter antagonism existed among his immediate subordinates. In fact, two of them had refused to speak to each other for eight years. All essential communication was in formal memorandums.

Dinner at Eight — The department head thought the situation over and invited the feuding supervisors and a couple of others to his home for dinner.

After dinner, the department head proposed an informal brainstorming session on a shop problem. Before long, the feuding supervisors were chiming in with ideas and improving on each other's contributions. When the time came to go, one offered to drive the other home, and they have been warm friends since.

Forget Selves — Example after example can be cited. The involuntary co-operation encouraged by the technique carries over into normal relationships.

It's not easy to resent a person with whom you have been brainstorming a company problem.

Evaluating the Technique

To many, brainstorming sounds like a crazy operation. The technique has its detractors who insist it won't work and that creative thinking can't be done by a group.

Advocates agree that it is only one form of creative thinking. But, they add, it works, and it's a lot of fun.

Willard Pleuthner, vice president in charge of the brainstorming group at BBDO and a long-time associate of Alex Osborn, says this:

"Brainstorming has been used in our agency for 15 years. We're using it more and more every month. Practically all our business brainstorming now is for repeat customers; clients that have had this service before."

You'll be a repeat customer, too, once you've given brainstorming a try and find out how bright your people are.

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ultrasonic inspection news

SIMAC INSPECTION SYSTEMS NOW AVAILABLE FOR GENERAL INDUSTRY USE

Through the development of standard-unit ultrasonic inspection equipment and auxiliary components, Sperry makes it possible to assemble automatic or semi-automatic SIMAC systems at greatly reduced costs. The basic unit is the Type UW Reflectoscope which can be combined with auxiliary test equipment to meet individual flaw detection requirements. Shown above, the UW Reflectoscope is being used to inspect an immersed aircraft forging which has contours requiring the use of a precision (PH) search unit positioner in order to control the direction of the ultrasonic beam projected into the part.

For contact or immersion testing:

The flexibility of the UW Reflectoscope enables it to handle a vast range of inspection problems, both contact and immersed. It is designed to be operated manually, semi-automatically (as shown at the left) and fully automatically in conjunction with other Sperry-engineered equipment.

The UW's wide range of 9 operating frequencies (from 200 kc to 25 mc) permits driving through coarse material or long distances using the lower frequencies, while the high frequency range can locate the smallest defects.

Immersion tanks have been standardized in several sizes to meet different inspection requirements and are also built to specification.

Automatic Signaling and Recording

The UWA Monitor is designed to operate in conjunction with the UW Reflectoscope to provide automatic signaling and recording of defects. Set up for a specific test, it interprets signals from the UW Reflectoscope and passes on the evaluated information to the operator in the form of signal lights and alarms. Permanent tape records can be made as well as actual automatic marking of the part under test.

Two additional displays of test information:

The UWB attachment supplements the Monitor with a cross-section view of the material being tested, displayed on a 12-inch CRT screen with long image persistence. Two meter indicators measure the amplitude of reflected signals.

To keep posted on latest developments in the profitable use of ultrasonic inspection, send for your copy of our Ultrasonic Inspection News Letter.

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Technical Outlook

SOVIET STEELMAKING—A visitor from behind the Iron Curtain gives this report on Russian steel plant operations: Blast furnaces produce 2100 to 2300 tons a day—operating with high top pressure and 70-to-90-per-cent sinter. Open hearths rated at 220 tons tap about 240 tons per heat and average 25 to 26 tons an hour, using 70-per-cent hot metal. At these rates, Red steelmaking is taking a back seat to no one.

HELPS VACUUM—Gallium—it melts in your hand, boils above 3500°F—promises to reduce the operating cost of vacuum equipment. The metal is used as a sealant. Advantage: Dismantling of retorts and tubing to clean and reseal leaking joints is less frequent.

CLEANER AIR—U. S. Steel has decided that electrostatic precipitators offer the best way to reduce dust from open-hearth operations. It plans to install them on its big No. 5 open-hearth shop at its Homestead Works.

CASTING RESEARCH—The Steel Foundry Research Foundation, established last month by the Steel Founders' Society, announces its first research projects: 1. Recommended practice for welding steel castings. 2. Correlation of destructive testing of steel castings with stress analysis and mechanical properties.

GAINING GROUND—Glenn L. Martin Co. has ordered $200,000 worth of high strength titanium bolts (they weigh 43 per cent less than steel) for its new SeaMaster jet bomber. Chance Vought has ordered a sizable quantity for its production aircraft. Convair bought $650,000 worth late last year. These orders, plus sales in qualification lots to more than a dozen other companies, have put $1.5 million worth of titanium business on the books at Standard Pressed Steel Co., Jenkintown, Pa., since the development was announced about a year ago (STEEL, Mar. 14, 1955, p. 117).

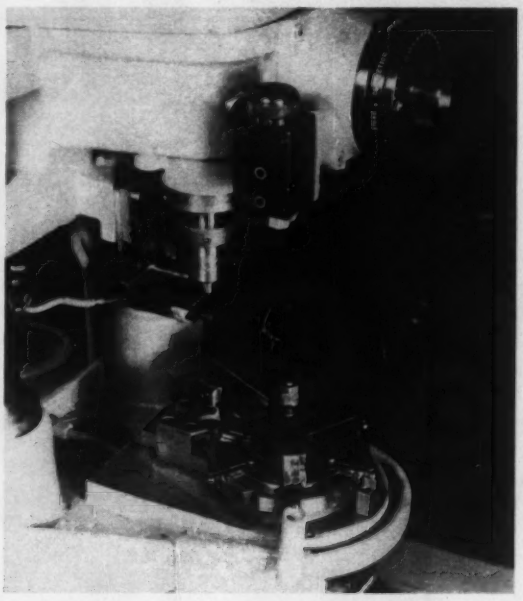
MIGHTY MIDGET—GE has a 4-pole, permanent-split-capacitor, induction motor that fits the rugged mechanical and space needs of the latest in typewriters and business machines. It's less than 3 in. across, weighs less than 4 lb and needs only 1 cc of oil for each bearing every two years.

NEW FINISH—Firestone Steel Products Co., Akron, says it has substituted an epoxy resin dip for zinc plating on its truck rims. The new coating shows no corrosion after 100 hours in salt spray.

PORTABLE SLEUTH—Structural steel bars, with a cross section 4 x 6 in., are being bent into circles and welded. Product: Huge gear blanks with an ID of 67 in. Immediately after welding, the joint is quick-checked with a portable, cobalt-bomb x-ray. The bomb is carried on a small, tubular-steel, four-wheeled cart. The ring is bent on a 600-ton horizontal press, built by McGregor-Michigan Corp., Detroit.

STITCH IN COLOR—Stitching wire finished in 12 colors (light and dark red, blue, green, brown, yellow and black and white) is being made by Acme Steel Co., Chicago. Called Colorstitch, it's regular stitching wire with a vinyl paint finish bonded to the galvanized surface. Expected uses: Boxes for sales displays and as an aid in inventory classification and control.

Metalworking Outlook—p. 59 *Market Outlook—p. 163*



Bores in tiny bearings only ⅛-in. in diameter are honed to size within 0.0003-in.; roundness and straightness are within 0.0001-in. Parts are held in floating fixtures. Rate: 180 an hour come off machine

Honing Tackles a Misconception

IF YOU want to see a honing expert bristle, refer to honing as a polishing operation.

Too many people in industry, experts say, think of honing as something akin to buffing. They don't recognize it as a machining method that's capable of removing metal.

Teachers — The misunderstanding about the nature of the animal has given the honing industry a new job: Education. Spokesmen admit it may prove to be their most important effort.

At Micromatic Hone Corp., Detroit, management feels it has to sell honing as a method, prove what it can do and show potential users what they're missing. Out of a broader acceptance of the method, Micromatic is sure it will get its share of a bigger market.

Equation — To emphasize the multifaceted values of its method, Micromatic has come up with a word equation: Microhoning (its tradename for it) equals stock removal + geometry + size control + surface finish.

The equation points up what engineers tout as honing's chief advantages. Indicative of what they think the emphasis has to be, they put surface finish last. That one, they feel, already is accepted.

Stock Removal — Honing cuts metal by abrading it at low velocities. It's primarily a shearing process. Thousands of minute grits cut at one time over a large area. A lot of stock can be whittled away.

As a general rule, honing will take off up to 0.010-in., although there's no limit to the amount of stock that can be removed. Cost is the overriding consideration. The answer lies in the time you'll allow for the job. Honing can take off from 0.020 to 0.030-in. a minute.

Geometry—As Micromatic sees it, honing works on two different geometries at the same time. Imperfections under 1/32-in. (microgeometry) show up as what most of us call surface quality. They're caused by a myriad of evils, including tool vibration, tool marks

Honing Case Histories

Thin-Wall Tubing—Oil well pump liners, 1045 steel, 30 to 32 Rc, are 98 in. long. They have a bore 1.5-in. in diameter. Without previous operations, the bore is honed to within 10 microinches. About 0.001-in. of stock comes off every minute

Parallel Flat Surfaces—Gear blanks drop automatically into a plate that carries them between two abrasive discs. End faces are honed to act as control surfaces for later operations. Thickness, 0.744-in., is held to within 0.0005-in. Parallelism between the two faces is held to within 0.0002-in. Surface finish is 20 microinches

Flat Sealing Surfaces—Aluminum diecast valve bodies come to honing already milled. Honing takes off 0.001 to 0.002-in. of stock, hones one surface every 3 seconds. Flatness is held within 0.0002-in. A matte finish of 15 to 20 microinches is produced

Small External Diameters—Hydraulic valve spools are 0.751-in. OD, 6 in. long. Hones take off up to 0.002-in. from the 62-Rc tool steel. Geometric accuracy is held to 0.000025-in.

Bore Squared with Face—Gear blanks whose bores must be generated square with the end faces are fed onto a machine table. As the table rises, the gears slip over the tool which expands to align the part with the spindle. The part is clamped on its end faces. Rate: 125 gears an hour. Squareness is within 0.0003-in.

Spherical Honing—Rod end balls (for ball-joint suspension) are 0.531-in. in diameter. Material is 52100 steel, 62 Rc. Honing trues and finishes sphere, takes off 0.001 to 0.002-in. of stock

Internal Helical Splines—Bearing surfaces of internal splines are honed (35 parts an hour) concentric with the pitch diameter of the teeth to correct distortion caused by heat treating. Size tolerance is held to 0.0004-in., roundness and taper to 0.0002-in.

or grooves and the metal structure.

Imperfections of more than 1/32-in. (macrogeometry) are thought of as affecting the shape of the part. They include waviness, out of roundness, taper, etc.

By abrading off the high spot, then working on the whole surface, honing corrects both micro and macrogeometry. Trouble is, coming as a final operation, honing doesn't have a chance always to control all variables—much to the dismay of the honing fraternity. Advocates ask, for example, that about twice the amount of error on the stock be left for honing. If a tolerance is likely to be out by 0.001-in., they'd like to have about double that left on for hone removal.

Size Control—Honing fans claim that because stock is removed slowly (at low surface speeds) distortion is kept to a minimum. Final size is easily controlled. By using adjusting heads, the operator has complete control of the tool expansion; he can control accurately the amount of stock removed to within 0.0001-in.

Automatic circuits, now standard attachments, can gage the operation continuously and can control the feed of the stones and stop the machine when final size is reached.

Surface Finish—Practical limits for a honed surface are from 1 to 100 microinches rms. Honing will take care of the highly refined surface of an antifriction bearing, or the rougher (but also functional) surfaces for automotive cylinder bores. Cylinder bores should have a 13-to-30-microinch surface to hold lubricant and wear properly. Honing's crosshatch is a natural for these wear applications.

Spreading the Word—That's the package honing fans have to sell. How to get the word to potential customers?

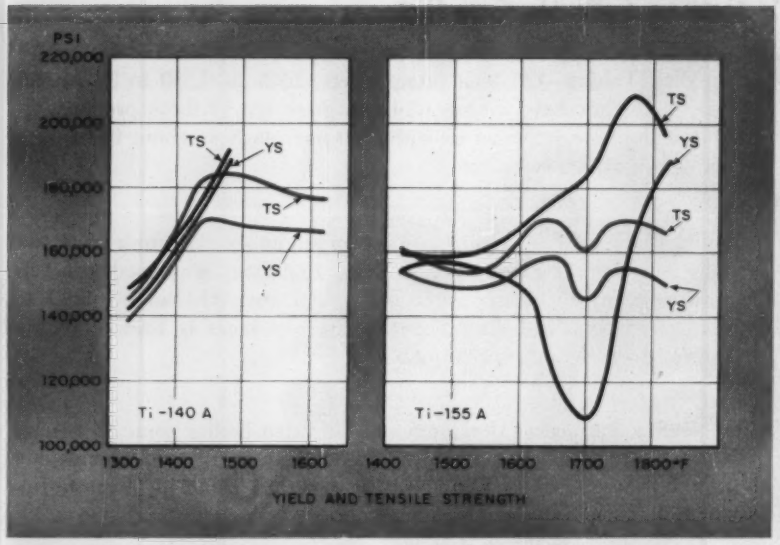
Micromatic's engineers feel they must interest the buyer with these generalities and niceties; then convince him that honing will put dollars in his pocket.

It means initial production work in a new field frequently is done behind closed doors in Micromatic's laboratory. Current work on antifriction bearings is a case in point.

Something for Nothing — Not long ago, a bearing manufacturer asked some of its customers what they needed in bearings to get better results. One answer: The quality of an ultraprecision bearing at the cost of a standard commercial bearing—something for nothing.

Micromatic's engineers are tackling that problem in their lab. With a complete set of machines, lacking only the connecting automation, they are honing the flat edges, the bore and the track of the inner races and the flats and track of outer races. By honing tracks they have reduced the noise level on running bearings by as much as 5 decibels. Tracks, incidentally, are honed to a ½-microinch finish.

When the engineers are sure what they can do, and they have the parts for proof, they'll take their story to the industry. From there on in it's in the customer's hands. If he buys, (and bearing makers are buying) chalk up another victory for honing. If he doesn't? Well, there still are plenty of fields to conquer.



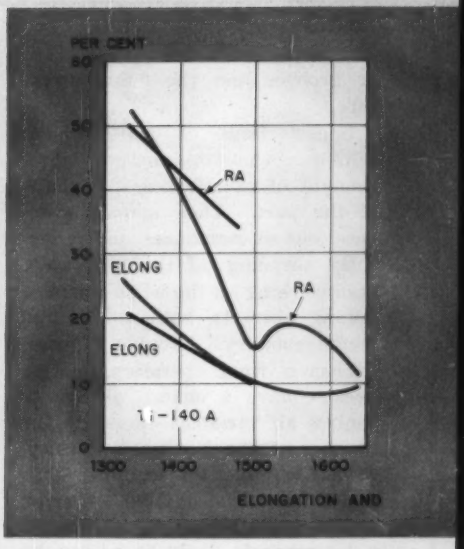


Fig. 1—Effect of solution temperature on tensile properties

More Heat Treatable Titanium

By H. E. FUHRMEISTER,
W. M. PARRIS and H. D. KESSLER
Titanium Metals Corp. of America
Henderson, Nev.

HEAT TREATING know-how for titanium alloys took a big jump forward in the past year. First came working data on Ti-6Al-4V (STEEL, Sept. 12, 1955, p. 98). Now the heat treatment pictures for Ti-140A and Ti-155A are being rounded out.

Both of these commercially important alloys respond to duplex solution and aging treatment with tensile strengths in the 200,000 psi area and good ductility. The treatments consist of: 1. Solution treatment at a temperature within the alpha-beta phase region, followed by rapid cooling. 2. Aging in the 800° to 1200°F region for sufficient time to produce the desired properties.

These treatments raise low temperature performance of the alloys to well above that of the annealed condition furnished by the mill. The outlook is good for their elevated temperature use when we know more about their stability and creep characteristics.

Ti-140A—The solution temperature range for this alloy is about 1300° to 1480°F. Below 1300°F, the beta phase is highly stable and does not harden appreciably upon aging. Above 1480°F ductility is impaired, both in the solution treated condition and after aging. The properties of ½-inch round bar of Ti-140A after various solution treatments are shown in Fig. 1. It shows that the strength level of water quenched and air cooled bars increases sharply as the solution temperature is raised from 1330° to 1480°F. At the same time ductility decreases.

The increasing strength reflects the transformation of greater amounts of alpha to the beta phase at the solution temperature (Figs. 2 and 3). The beta is stronger than alpha and its strength is further increased by age hardening during cooling.

The tendency for age hardening increases as the solution temperature is raised. Quenching from temperatures above 1480°F results in severe embrittlement due primarily to this age hardening phenomenon. Air cooling from about 1480°F or above allows the reaction to proceed to a point of overaging at which some alpha precipitates from the beta with a consequent decrease in strength and retention of some ductility.

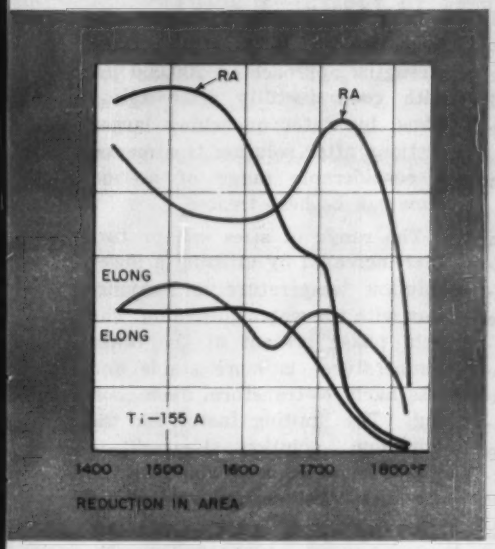
Aging — Although good high strength properties (192,000 psi, 9 per cent elongation) can be attained in Ti-140A by solution treatment alone, the alloy in this condition is of little use commercially. The retained beta is unstable at elevated temperatures and would age harden causing severe embrittlement when subjected to service temperatures of 300°F or higher.

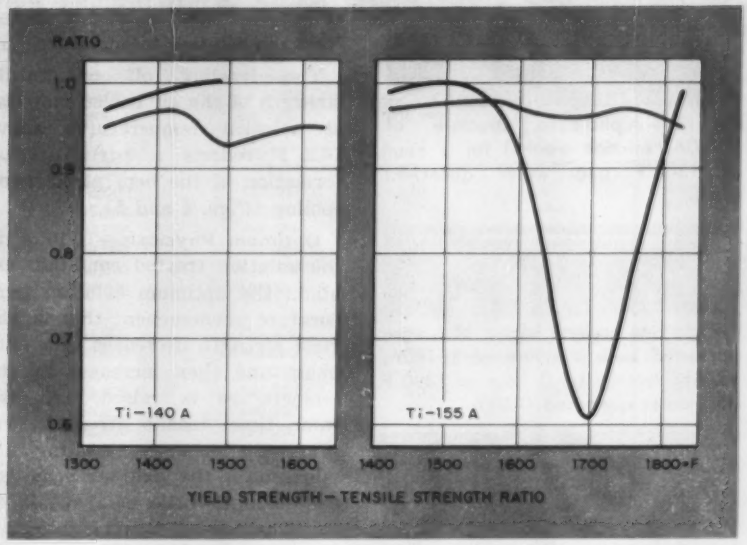
By aging the solution treated alloy at temperatures in the range 900° to 1100°F, excellent combinations of mechanical properties over a wide strength range are obtained as well as improved stability (Table 2, page 121). Actually, the term "aging" is somewhat of a misnomer. The process involved in heating for relatively long periods of 900° to 1100°F is overaging.

Aluminum Different—In this respect, the heat treatment of alpha-beta titanium alloys differs from that of most aluminum alloys. In the latter, the strength increase depends upon the formation of a transition phase coherent with the matrix. In titanium alloys, the transition phase (omega phase) must be passed through and dispersion of the stable alpha phase produced before good properties and a stable structure develop.

Completion of the omega reaction and precipitation of alpha is achieved within practical time limits only at temperatures of 800°F and above. Hence, the choice of 900° to 1100°F for aging Ti-140A.

Strength Up—Tensile strengths ranging from 138,000 to 204,000





psi with corresponding elongations of 30 and 12 per cent, respectively, were obtained in tests. Generally, the strength after a given aging treatment is higher for the higher solution temperature (1480°F). This would be expected because of the relatively larger volume of beta phase in material quenched from the higher temperature.

Strength after a given solution treatment varies inversely with aging temperature. Likewise, increasing the aging time from 4 to 24 hours slightly decreases strength and improves ductility.

Water vs. Air—Comparison of the properties obtained after water quenching or air cooling from the solution temperature followed in each case by aging shows that Ti-140A has good hardenability (depth of hardening). For example, ½-inch round bar quenched from 1480°F and aged for 4 hours at 1000°F had a strength of about 175,000 psi; air cooling from 1480°F followed by the same aging gave about 168,000 psi strength.

The retention of high strength after air cooling and aging indicates that the beta phase is relatively stable and decomposes only slightly during cooling. By water quenching, appreciably heavier sections can be heat treated.

Variety of Sizes—Using lower solution temperatures (below 1480°F) will further increase the range of section sizes which can be heat treated, due to the higher alloy content and consequent greater stability of the beta phase at the lower temperature. In addition to the ability to be hardened in heavier sections, high hardenability is important in that smaller section sizes may be air cooled from the solution temperature, thus avoiding quench distortion.

An interesting feature of solution treated and aged Ti-140A is the good correlation between strength and ductility, regardless of the heat treatment. Elongations at a given strength level fall within 5 per cent over a wide range. A variety of heat treatments may be used to obtain a given set of properties in an intermediate strength range (up to 180,000 psi). If very high strengths are desired, the choice of solution and aging temperatures will be more restricted.

Table 1—Heat Treatable Titanium Alloys

Composition	Ti-6Al-4V	Ti-140A	Ti-155A
Ti	89.5	93.7	88.0
Fe	0.25 max	1.5 – 2.5	0.9 – 1.7
Cr	——	1.5 – 2.5	0.8 – 2.0
Al	5.5 – 6.5	——	4.75 – 6.0
Mo	——	1.5 – 2.5	0.8 – 2.0
V	3.4 – 4.5	——	——
Others	C 0.10 max; W 0.02 max; Si 0.02 0.04 max; N_2 0.08 max; H_2 0.015 max		
Mill condition	annealed	annealed	annealed
Recommended solution treatment	Temp 1550°-1750°F; Time 1 hour for each inch of cross section; Quench water	1300°-1480°F; water	1525°-1775°F; water
Recommended aging treatment	Temp 900°-1100°F; Time 2-24 hours	900°-1100°F; 8-24 hours	900°-1100°F; 8-24 hours

Ti-155A—This alloy is usually supplied and used in the annealed condition. The recommended annealing treatment for maximum strength with adequate stability consists of heating for 24 hours at 1200°F followed by air cooling.

Strength progressively increases as the annealing temperature is raised from 1100° to 1400°F. However, annealing at 1300°F or higher results in a structure which is unstable under stress at elevated temperatures. Annealing at 1200°F produces material which is stable under stress at temperatures up to at least 650°F.

Solution Treatment—The useful

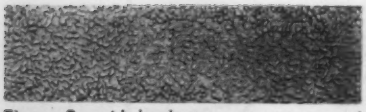


Fig. 2 — Alpha-beta structure of Ti-140A, solution treated for 1 hour at 1300°F and water quenched (X500)

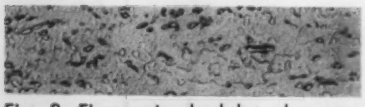


Fig. 3—Fine-grained alpha plus age-hardened beta structure of Ti-140A, solution treated for 1 hour at 1480°F and water quenched (X500)

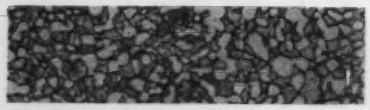


Fig. 4—Primary alpha plus alpha precipitate in beta matrix structure of Ti-155A, solution treated for 1 hour at 1700°F and air cooled (X500)

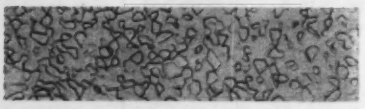


Fig. 5—Retained beta matrix with islands of primary alpha structure of Ti-155A, solution treated for 1 hour at 1700°F and water quenched (X500)

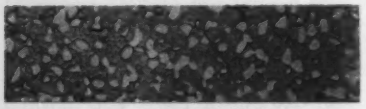


Fig. 6—Primary alpha plus alpha precipitate in beta matrix structure of Ti-155A, solution treated for 1 hour at 1700°F, water quenched and aged at 1100°F for 8 hours followed by air cooling (X500)

solution temperature range for Ti-155A is about 1425° to 1775°F. When solution treated below 1425° F, the alloy is relatively stable and will not age harden sufficiently upon subsequent treatment to give useful increase in strength. Solution treating above 1775°F seriously impairs ductility.

Typical tensile properties of ½-in. round bar of Ti-155A after various solution treatments are shown in Fig. 1. Tensile strength generally increases with increasing solution temperature, reflecting the greater proportion of beta phase present at the higher temperatures. Ductility remains high up to a solution temperature of 1700° F for water quenched specimens and 1775°F for those air cooled from the solution temperature.

The leveling off of tensile strength of the air cooled material at solution temperatures above 1625°F reflects a partial transformation of the beta phase upon cooling (Figs. 4 and 5).

Optimum Physicals—Ti-155A in the solution treated condition exhibits the optimum solution temperature phenomenon; that is, the yield strength decreases to a minimum and then increases as the temperature is raised. At the same time, tensile strength progressively increases, resulting in a minimum in the yield strength-tensile strength ratio at about 1700° F. The reason for this behavior is not known, but it is apparently associated with the aluminum present in Ti-155A. Ti-140A does not exhibit it even though this alloy has approximately the same beta-stabilizer content as Ti-155A.

The aluminum present in Ti-155A greatly extends the alpha-beta phase region to higher temperatures over that of Ti-140A, thereby increasing its useful solution temperature range. Solution temperatures as high as 1775°F can be used for Ti-155A prior to aging while 1480°F is the upper limit for Ti-140A.

Aging Treatments — Excellent mechanical properties can be obtained in Ti-155A after solution treatment at 1625° - 1775°F and aging at 900° to 1100°F as shown in Table 2. Tensile strengths of over 200,000 psi combined with reasonable ductilities are possible. Generally, raising the solution temperature results in increased strength after a given aging treatment. Increasing aging temperature or time decreases strength.

Cooling rate from the solution temperature prior to aging is important. For example, air cooling ½-in. round bars of Ti-155A from 1700°F and aging gives considerably lower strength than water quenching from the same temperature followed by aging (Table 2). The lower strength after air cooling and aging is due to the partial transformation of the beta phase during the air cooling cycle, leaving less retained beta to be age hardened.

In spite of this partial transformation, Ti-155A still attains strengths approaching 200,000 psi with good ductility after aging. Thus, by water quenching larger sections after solution treatments, a considerable range of section sizes can be heat treated.

The range of sizes can be further increased by utilizing a lower solution temperature in conjunction with the water quenching. The beta phase present at the lower temperatures is more stable and less likely to transform upon cooling. The limiting factor for the minimum solution temperature which could be used would be the strength level desired.

Useful Properties — Solution treated and aged Ti-155A, like Ti-140A, shows good correlation between tensile strength and ductility regardless of the heat treatment used. With few exceptions, for a given strength level, the elongation range is not more than 5 per cent. Thus, a variety of heat treatments may be used to attain a given set of properties up to about 200,000 psi.

A typical microstructure of solution treated and aged Ti-155A is shown in Fig. 6. The heavy darkening of the beta phase due to alpha precipitation is characteristic of alloys containing molybdenum and/or vanadium.

It is apparent that Ti-155A, like Ti-140A, is a highly heat treatable alloy. Generally, heat treated Ti-155A has higher strengths than Ti-140A, because of the solid solution hardening effects of aluminum.

Stability—Caution must be exercised in applying these duplex heat treatments to parts which will be subjected in service to stress at elevated temperatures. The stress stability of Ti-155A and Ti-140A in high strength heat treated conditions is still under investigation.

Until information on their creep characteristics, impact strength, notch sensitivity, endurance limit and distortion is generally available, the use of heat treatment should be restricted to applications at temperatures below 300°F.

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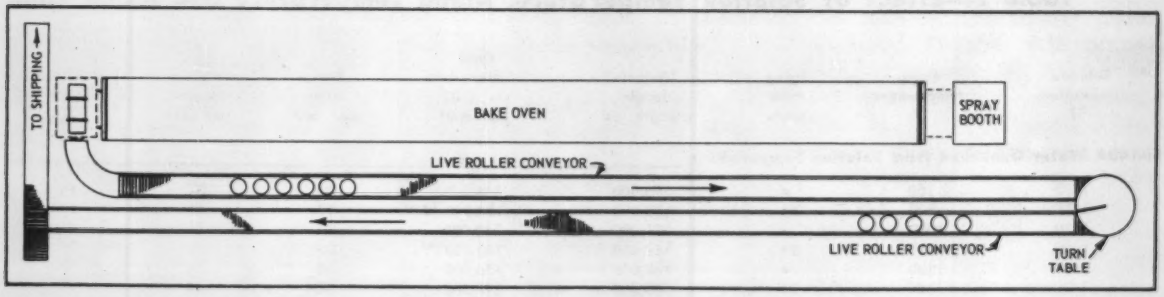
Table 2—Effect of Solution Temperature, Aging Temperature and Aging Time

Solution temperature °F	Aging temperature °F	Aging time hours	Ultimate tensile strength, psi	Yield strength psi (0.02 per cent)	Elongation per cent	Reduction in area per cent	Hardness Rockwell C
Ti-140A Water Quenched from Solution Temperature							
1430	900	4	193,000	159,500	15	37	44
1430	900	24	183,000	159,000	17	46	44
1430	1000	4	170,000	148,000	21	51	41
1430	1000	24	158,000	142,000	26	61	39
1430	1100	4	148,000	136,000	26	54	38
1430	1100	24	139,000	127,500	30	54	37
1480	900	4	204,000	173,000	12	27	46
1480	900	24	192,000	163,000	13	34	44
1480	1000	4	175,000	152,000	18	47	42
1480	1000	24	162,000	146,000	20	54	38
1480	1100	4	153,000	140,000	27	57	37
1480	1100	24	143,000	131,000	32	58	37
Ti-140A Air Cooled from Solution Temperature							
1430	900	4	179,000	130,000	19	45	43
1430	900	24	172,500	136,000	19	46	43
1430	1000	4	162,000	141,000	24	53	41
1430	1000	24	153,000	138,000	29	54	38
1430	1100	4	145,000	125,000	30	55	38
1430	1100	24	138,000	121,000	30	55	36
1480	900	4	189,500	142,500	14	32	45
1480	900	24	179,000	144,000	19	43	43
1480	1000	4	168,000	137,000	20	50	41
1480	1000	24	159,500	137,000	22	52	40
1480	1100	4	151,000	130,000	26	59	38
1480	1100	24	143,000	121,000	30	56	37
Ti-155A Water Quenched from Solution Temperature							
1625	900	2	222,000	157,000	3	3	47
1625	900	8	218,000	181,000	6	9	48
1625	900	24	220,000	146,000	4	4	48
1625	1000	2	203,000	172,000	9	17	44
1625	1000	8	191,000	148,000	15	30	44
1625	1000	24	185,000	169,000	14	44	44
1625	1100	2	179,000	165,000	15	43	43
1625	1100	8	175,000	164,000	11	32	42
1625	1100	24	166,000	158,000	22	50	38
1700	900	2	250,000	235,000	3	6	51
1700	900	8	247,000	236,000	3	5	51
1700	900	24	249,000	225,000	1	3	51
1700	1000	2	227,500	171,000	5	6	49
1700	1000	8	211,500	180,000	4	8	46
1700	1000	24	208,000	185,000	10	26	45
1700	1100	2	203,000	162,000	10	29	45
1700	1100	8	191,000	184,000	12	33	44
1700	1100	24	177,000	163,000	17	44	43
1775	900	2	242,000	197,000	0.5	0.2	52
1775	900	8	243,000	209,000	1	3	53
1775	900	24	234,000	196,000	2	6	50
1775	1000	2	230,000	150,000	3	9	51
1775	1000	8	224,500	188,000	3	4	48
1775	1000	24	215,000	167,000	5	8	48
1775	1100	2	207,000	164,000	9	22	46
1775	1100	8	202,000	178,000	8	11	45
1775	1100	24	195,000	167,000	8	23	45
Ti-155A Air Cooled from Solution Temperature							
1700	900	2	174,000	141,000	16	35	42
1700	900	8	180,000	153,000	13	37	42
1700	900	24	187,000	150,000	17	40	41
1700	1000	2	176,000	155,000	17	39	42
1700	1000	8	176,000	157,000	16	50	42
1700	1000	24	175,000	158,000	18	43	42
1700	1100	2	169,000	154,000	20	43	41
1700	1100	8	166,500	145,000	20	42	38
1700	1100	24	162,000	145,000	20	44	40



Layout of system for painting, baking and cooling steel drums at Calig Steel Drum Co.

Cooling Conveyor Rolls Down Costs

CALIG STEEL Drum Co., Pittsburgh, is saving $38,400 annually through the use of two live roller conveyors to cool oven-dried steel drums while en route to the shipping area.

Rejects caused by handling drums before they were dry have been eliminated at a saving of $100 a day. Men needed in the drying and cooling operation have been reduced from four to one at a weekly saving of $240 in wages.

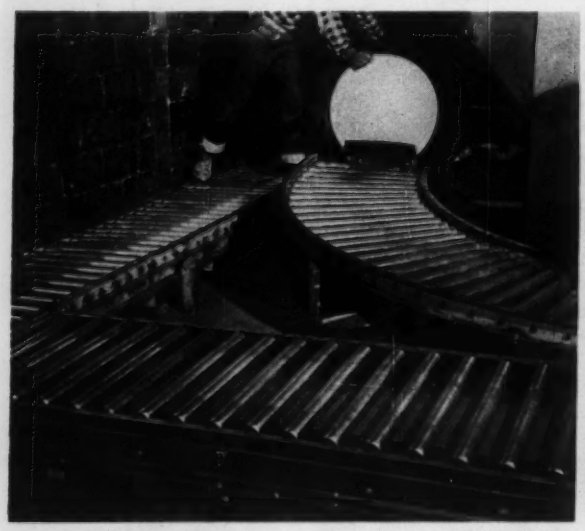
Procedure — After drums are painted, they are put through an 80-ft bake oven and cooled en route to shipping. Before installation of the new equipment, the drums were pushed along gravity conveyors and were not properly cooled or dried before reaching the area where open ends were covered.

Calig Steel installed two Rapistan live roller conveyors, one 93 ft long, the other 100 ft long. These powered conveyors have two sets of rolls with a moving belt between them. The rate of speed can be predetermined. A Rapistan Turntable 5 ft in diameter completes the installation.

How It Works — Painted and heat-dried drums are removed from the bake oven mechanically and put on the conveyor. They require 15 minutes to cool and set. Painted drums move on the 93-ft-long conveyor running parallel to the oven. Travel time here is 7 minutes.

At the end of the first section, the flow is reversed with the turntable which transfers drums to the 100-ft section. Travel time here is 8 minutes. Drums reach the end of the line cool and dry. "Open end" drums are closed on the conveyor.

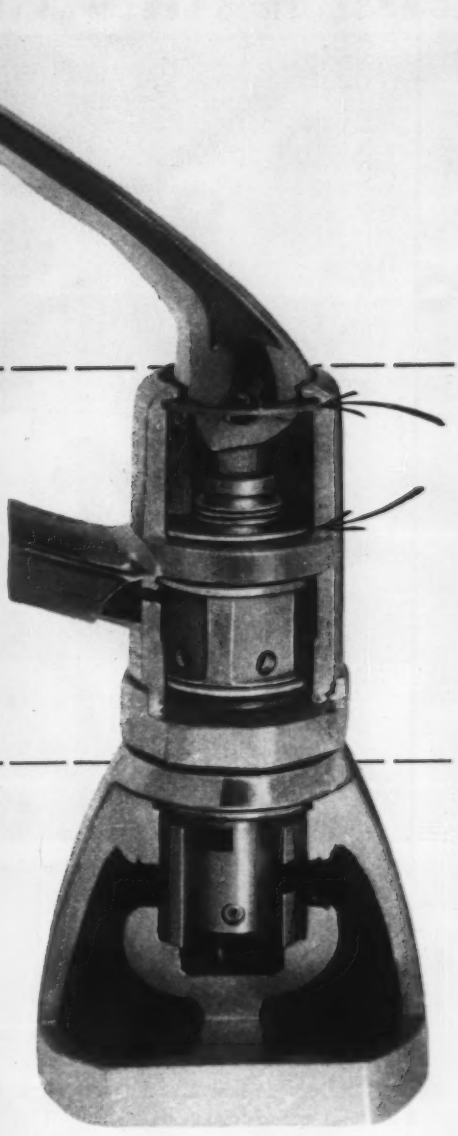
Added benefits: Production capacity is increased. There are additional savings in labor because drums are not transferred to another area for closing. Plant space formerly needed for closing and allowing drums to cool is freed for other uses. Personnel morale is improved because of the elimination of burn injuries.



Worker guides drums from bake oven onto gravity conveyor that connects to live roller system. End of the 193-ft system is in foreground. At left is conveyor to shipping area

Turntable transfers drums to 100-ft section of the cooling conveyor, starting them back to the shipping area. Open ends of the drums are closed on this conveyor line

Look into REVERE Phosphor Bronze – it pays RAVENNA to use it!



This Moen Single Handle Mixing Faucet contains an anchor disc and an anchor washer, both stamped out of Revere Phosphor Bronze Strip. These are small parts, but in a fine product such as this faucet, high quality metals must be used throughout. Here is a condensation of the manufacturer's experience with the phosphor bronze:

Anchor Disc: • Standard punching speed maintained. • No pre-straightening off the arbor for the automatic punching process. • No excessive die wear. • Corners are sharp and clean; no de-burring needed. • Natural mill finish is better than they could achieve by tumbling or burnishing. • High tin content means no lubrication is required; they call it "silent brass."

Anchor Washer: • Have not had a single surface failure. • Dry tumble to de-burr. • Good fatigue characteristics and no obvious signs of corrosion.

Revere offers several types of phosphor bronze, each with slightly different characteristics. In addition to this alloy, Revere also supplies Ravenna with round and octagonal leaded brass tube and free-cutting brass rod, for use in various parts of the valve. We will be glad to collaborate with you on selection of just the right forms of the correct alloys for your products, present or projected. See the nearest Revere Sales Office.

Moen Single Handle Mixing Faucet, made by Moen Valve Co., Division of Ravenna Metal Products Corp., 6518 Ravenna Ave., Seattle 15, Wash.

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Pouring double heat steel rolls at Ohio Steel Foundry Co.

Rollmaking Forges Ahead

FOUR YEARS out of the last five, cold rolled led all other finished steel in tonnage. Last year it widened its lead.

In Lima, O., you can see how rollmaking reacted. At the Ohio Steel Foundry Co., concrete breakers are hacking away at the remains of a general foundry floor. This plant eliminated all miscellaneous steel casting work from its production schedule in 1954 to specialize in roll production.

Shift—The company is putting particular emphasis in a direction new for it: Forged rolls. It still will make cast rolls in wide variety, but in its $2-million-plus expansion program, cold rolling demand points the way. More forged rolls are needed to take cold rolling's high speeds, heavy pressures and fine finish.

Along with the change in emphasis has come spectacular equipment. The show piece is a 260-hp Waldrich-Siegen lathe for machining cast steel backup rolls. It frees smaller equipment for roughing forged rolls. Two more of the big lathes are coming from Germany.

The lineup of bell-type furnaces is impressive, too. With big rolls, and with treatment that varies from roll to roll and lasting for many days, annealing and hardening are frequently one-roll-to-a-furnace operations.

Forgings — Hot metal for roll forgings comes from 22-ton and 7½-ton basic electric furnaces. The company leans to a squat, fat ingot that requires maximum working in the forge to produce the elongated rough rolls.

Ingots solidify under electric hot tops, sand molded instead of being made of refractory shapes. They're powered by a bank of small alternating-current welding transformers. With many sizes of hot tops operating at once, the bank provides wide power variation at low cost.

These high carbon alloyed ingots must be forged in a narrow temperature range to insure internal soundness and optimum surface qualities. After forging, they are annealed and rough machined.

Double Cut — A new Ingersoll horizontal-spindle duplex milling machine has been installed to machine the drive ends—slots, keyways and couplings. It will take a roll 60 in. in diameter between cutters.

Then the rolls go back into gas-fired furnaces for a hardening cycle. Rolls must receive a drastic quench treatment to reach hardness specifications. During the entire hardening cycle, close metallurgical control must be maintained.

Finish—Roll grinders that can handle rolls up to 60 in. in diam-

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MESTA MACHINE COMPANY
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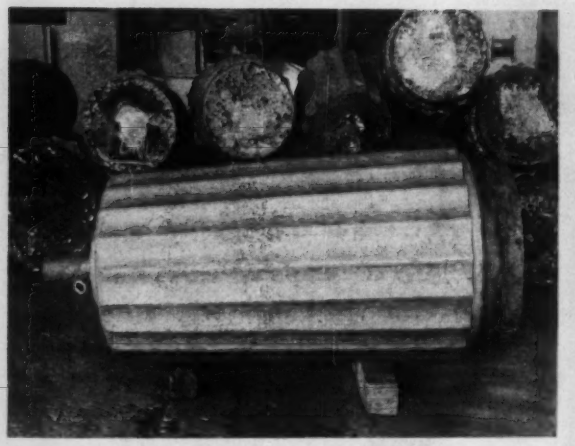
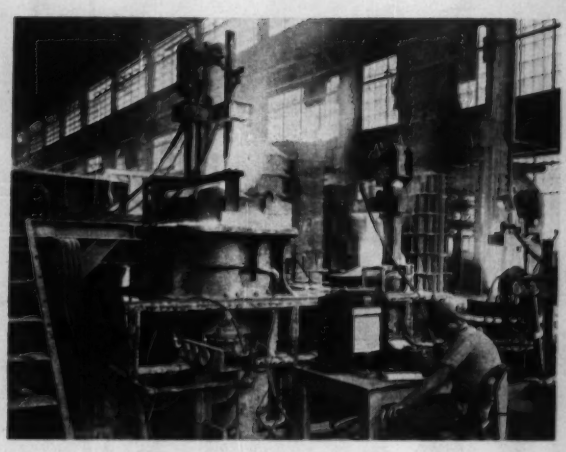
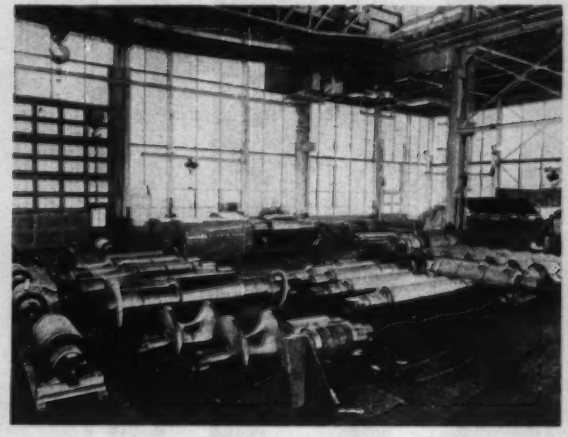


Squat, fat ingots that will become forged rolls



Electric hot tops, used on both forged and cast steel rolls

260-hp Waldrich Siegen lathe for machining cast steel rolls



Shipping bay, with finish grinding in the background

eter and 26 ft long put on the finishing touches. Some rolls get a mirror finish. Others will be rough ground for customers who prefer to finish their own. Four additional grinders are being installed to keep up with expanded production.

The packing and shipping area is adjacent to the grinders to minimize handling and danger of damage. Although the company lies close to big steelmaking centers—almost exactly in the steelmaking center of the U.S.—its business is far from local. It regularly ships rolls to Europe, Africa, Japan and India.

Growth — Ohio's facilities for making cast iron and cast steel rolls, which comprise the bulk of its business, are being enlarged. The company recently added four direct-fired furnaces which burn pulverized coal for iron melting. There also is a 46-in. cupola. Steel heats are melted in 38-ton and 53-ton acid open-hearth furnaces.

With each roll a made-to-order proposition, controls have to be tight. There's an air of conscientiousness in the shop that isn't accidental. You can see part of the reason every morning at 9:30.

Clinic—At that hour all metallurgists, inspectors and supervisors gather around a table in a room that would flatter a board of directors. This is the roll clinic, where information on new orders is brought together with background material on comparable jobs which is culled from the files and the experience of the group.

Here the day's work is planned. The program for each roll is made out on a detailed work sheet, and everyone at the meeting gets a copy. The work sheet includes a record of experience as a guide.

Control — As a roll starts through the production schedule, process control engineers assume over-all supervision. They make a constant series of checks: Furnace charge selection, tapping and pouring temperature, metal fluidity, proper swirl in pouring the casting, temperatures at shakeout, heat treating temperatures, hardness checks while machining and inspection by supersonic reflectoscope.

They make one check you won't see elsewhere. Ohio Steel Foundry uses water chills in its molds. The chills, water jackets of welded pipe, must be exactly ½-in. under the sand surface. If deeper, they lose their effect; if shallower, there's danger of washout, putting hot metal directly against the cold water pipe, with danger of explosion.

Even after a roll has seen service, the company maintains a paternal interest. "We try to buy back our worn-out rolls for scrap," says John Dugan, manager of the roll division. "We know what went into them." He has more than the metal in mind.

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● In these days of competition for engineering talent, McKee can supply the services of a large, experienced organization that is well-qualified to design your new plant.

McKee designs and builds blast furnaces, steel plants, petroleum and chemical processing plants, ore preparation facilities and industrial plants. This wide diversification of activities and our fifty-year record of successful, world-wide operation are among the factors which attract top engineers to McKee. Our large staff grows steadily and we continue to welcome applications of qualified men in many fields.

For you, this adds up to an experienced organization capable of undertaking your new plant project promptly and efficiently regardless of size or location.

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Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
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Canada: Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto

High Heat

How Stainless Steel from the **HOUSE OF STAINLESS** Provides Super Heat-Resistance for *South Wind* Aircraft Heaters

THE NEED—In developing their Model 940 gasoline-fired heater for private and commercial aircraft, South Wind engineers were confronted with a two-fold problem. They needed a material for the combustion chamber and the heat exchanger that would withstand the terrific heat generated and, at the same time, provide resistance to corrosive conditions.

THE ANSWER—With so many different types of stainless steel available, it was a matter of determining which stainless would best meet their specific need. Drawing on the experience of CSS metallurgists and the sales representative serving them, South Wind engineers were quickly able to select the right stainless for the purpose, with a minimum of experimentation.

Photo, courtesy South Wind Division, Stewart-Warner Corporation, Indianapolis, Ind.

Knowing that stainless steel is the best material for your product is only part of the answer. It is equally important to know *which* stainless will do the best job for you.

The House of Stainless will help you select the proper grade and type, and back up this assistance with comprehensive warehouse stocks and direct mill shipments through our mill placement department.

The House of Stainless
CSSC
STEEL AT YOUR SERVICE

Just phone
LAfayette 3-7210

CHICAGO STEEL SERVICE COMPANY

Kildare Avenue at 45th Street, Chicago 32, Illinois
Mailing Address: P.O. Box 6308, Chicago 80, Illinois
Milwaukee District Office 757 N. Broadway, Milwaukee 2, Wisc.
Telephone BRoadway 3-7874

Sales Representatives at Bloomington and Rockford, Illinois; Indianapolis and South Bend, Indiana; Cedar Rapids and Davenport, Iowa; Grand Rapids, Michigan; Minneapolis, Minnesota; Appleton, Wisconsin.

Surface Finish Indicator

CHECKING surface finish isn't a laboratory chore any more. A portable inspection instrument called the Surfindicator checks parts still in the machine. It weighs 15 lb, will check metals, plastics, glass, ceramics, etc.

An excessively fine surface finish is wasteful; too coarse a finish produces rejections. The Surfindicator will maintain parts closer to surface specifications.

One advantage of the instrument is in statistical quality control. Readings plotted on a chart posted next to a machine will indicate whether it is producing surface finishes within control. Where surface finish is vital, the statistical method tells the trained observer when machinery needs adjustment and maintenance.

Rugged—Brush Electronics Co., Cleveland, builds the instrument to take the shocks of normal shop usage. Moving it from place to place will not affect its sensitivity or accuracy. The instrument is calibrated with the new ASA specifications. It can be used on flat or curved surfaces and internal finishes.

The Surfindicator is being used to check shaft finish while the shaft still is in the machine. Plotting the readings on a graph will tell when the machine needs maintenance

Identifying raw material is easy for the Metal Monitor. The instrument can detect a 1 point difference in the carbon content of steel

Metal Monitor

IDENTIFYING a doubtful metal is duck soup for an inspector armed with a Metal Monitor. It is a portable instrument that identifies ferrous and nonferrous metals by comparison with known samples and helps the sorting of mixed metals into homogeneous groups for further analysis.

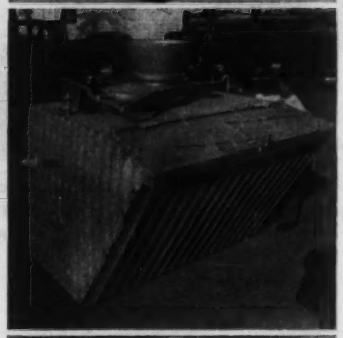
The Monitor also checks stock, parts in process or finished products for hardness, heat treatment, metallurgical structure, uniformity, plating thickness and adhesion. It can detect differences of less than 1 point of carbon in steels.

Operation—The device uses the thermocouple effect: The junction of two dissimilar metals produces an electric current. Two electrodes are used, one of which contains a heating element. In contact with an unknown metal, a voltage flows between the two electrodes. The voltage is amplified and transmitted to the monitor where it is measured by a meter. The reading is compared with those from calibrated samples.

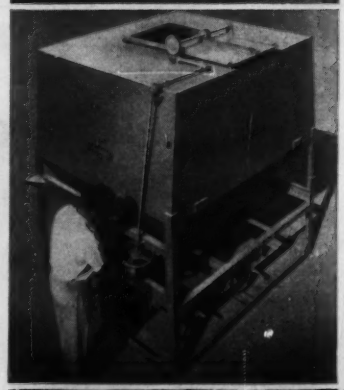
The device is easy to use and requires no special training. It is portable (21 lb), nondestructive and leaves no marks on finished products. Only a small, flat area is required for contact. The maker, Brush Electronics, Cleveland, says that as high as 3000 tests an hour are routine.

Briefly, this ad illustrates why DEMPSTER-DUMPSTER SYSTEM

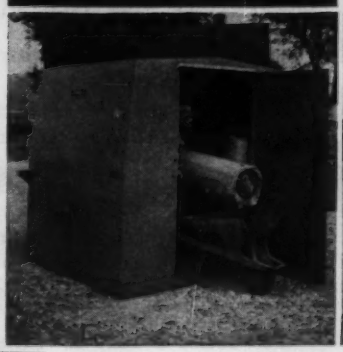
Container at right has cast iron bottom and inside walls are lined with fire brick. It handles hot skim off aluminum.



This Tilt Type Container was the result of a cost-cutting idea whereby a high temperature dusty product would be handled by a plant's Dempster-Dumpster. Container has cooling fins, counter-balanced hinged lid with 3-way locking device, 16" sliding gate valve and two sight-glass inspection openings.



Here is a Hopper Type Container with a top door for filling and two bottom discharge doors operated by rack and pinion. Another case where the Dempster-Dumpster System was applied to an additional problem to further reduce costs.



Container at right is just one of several different types we have designed to handle equipment, materials, packages, parcels, etc.

IN A NORMAL INSTALLATION the Dempster-Dumpster System is purchased by a plant because of its proved record for handling bulk materials at tremendous savings. This normal installation usually includes one truck mounted Dempster-Dumpster and any number of standard containers designed to meet the various requirements within the plant. In some cases, containers number 40 to 50. These containers can range in capacity up to 21 cu. yds., with all containers served by the one Dempster-Dumpster.

In the great majority of cases this basic installation is just a starter. Management men, constantly looking for lower operating costs, find numerous and amazing extra savings in the Dempster-Dumpster System. Once in service, transporting developments of every description come to light that supplement the original functions of the equipment. Your own men find easier, quicker and additional cost saving ideas for its use. Many even overshadow the original savings and the equipment becomes more and more indispensable.

Look over just a few of the "Special" containers illustrated in this ad. They are all the result of rough ideas that originated with the men in plants after a basic installation, then developed by our engineers. All ideas were stimulated by the powerful Dempster-Dumpster and its flexibility in picking up, hauling, setting down or dumping anything that needs transporting, at lower cost.

One man, the driver, and a few simple hydraulic controls in the cab of a Dempster-Dumpster, will become indispensable in your plant. It is just that in hundreds of plants of every description throughout the nation. Let one of our representatives give you details of installations. Manufactured exclusively by Dempster Brothers, Inc.

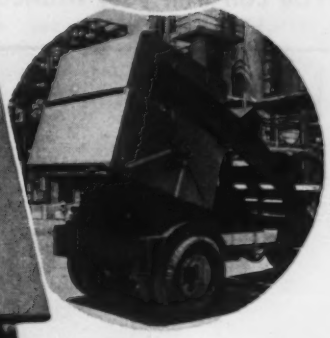
Above container is built with cast iron liner. The holes in outer wall are for cooling.

Here is one of several special drop bottom type containers equipped with couplers and ball bearing trucks for operation in train on rails.

THE DEMPSTER DUMPSTER SYSTEM

DEMPSTER BROTHERS

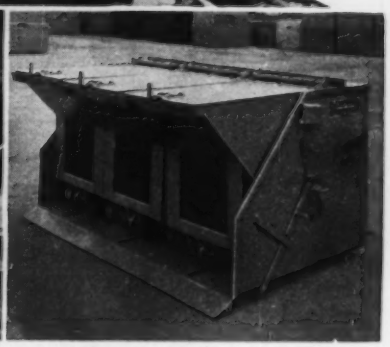
so many plants find the indispensable...



Two photos above show how all containers, regardless of design, are picked up and hauled. At destination materials are dumped from drop bottom containers as shown at left . . . from Tilt and Skip Type Containers by tilting. Any load, of course, may be set down intact.

This is a special adaptation whereby waste zinc slurry is pumped into two containers, which serve as settling tanks, enabling majority of the water to be decanted before sludge is transported and dumped at waste basin.

Tank Type Containers are available with or without casters in steel, aluminum, stainless steel, etc. Capacity ranges up to 1,200 gal. They may be lined with rubber, lead, highly resistance coatings, etc.



This is a master container with three 2 cu. yd. insert containers. Each insert container is provided with casters, counter-balanced spring-hinged lid for loading and dumping.

646 DEMPSTER BLDG., KNOXVILLE 17, TENNESSEE

You can trim your fabricating dollars with these . . .

Tips for Better Weldments

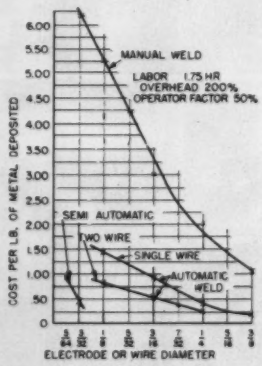
"THE GREATEST thing we have to change is men's minds. That's one reason we built this laboratory—to find facts that would convince our staff that welding is here to stay."

Those words were spoken by L. C. Ricketts, vice president of manufacturing, Worthington Corp., Harrison, N. J. He was talking about the firm's new, 5000-sq-ft, welding application laboratory.

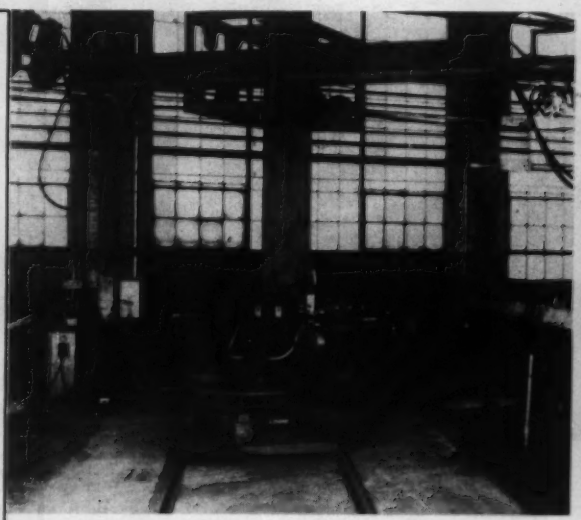
It's quite an admission from an outfit that has been and still is one of the nation's largest founders. Worthington isn't dropping casting; the laboratory finds the best method of combining castings with weldments. It builds prototypes and trains operators, supervisors, designers and engineers in fundamentals of welded construction.

Here are some of the facts it teaches.

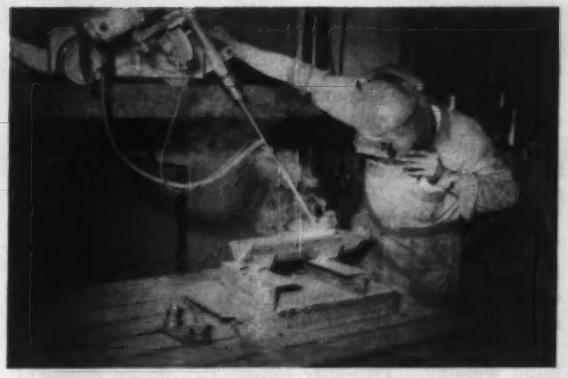
Wrap It Up—One of the biggest cost savers has has been the wrap-around or bending technique. Many fabricators break down an assembly into many, small flat pieces that are easy to blank or shear. The assembly is then tacked or held in a fixture and welded.



Increasing wire diameter cuts welding costs. Use the largest electrode consistent with a good weld. Remember that electrodes that are too big will bridge, won't reach the root, will trap slag, encourage porosity and increase stress risers. Values shown are based on current densities of 30,000 amp per sq in.; 70,000 is better



A tilting floor for heavy weldments pays its own way. Pins and bearings on all four sides and the hydraulic



Use as large an electrode as you can. This automatic uses a ¼-in. rod. Only limit is bridging, slag inclusions and weld quality

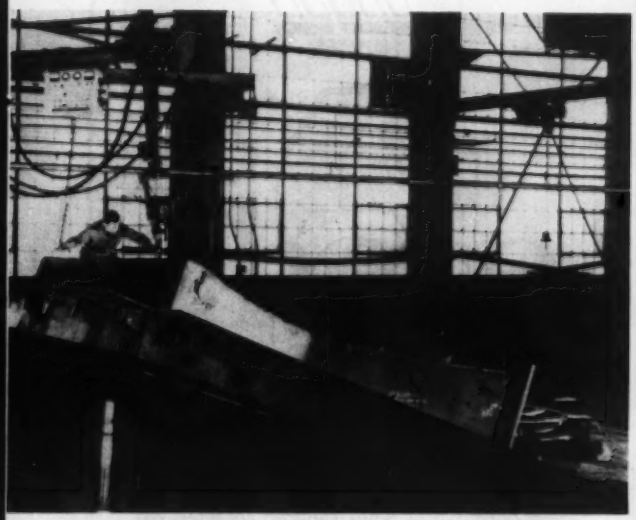
Such a design warps, and the cost is high; each piece must be welded to the next.

It's best to develop as many of the sides of the part as you can into one continuous sheet. Form it on a brake press, then weld it.

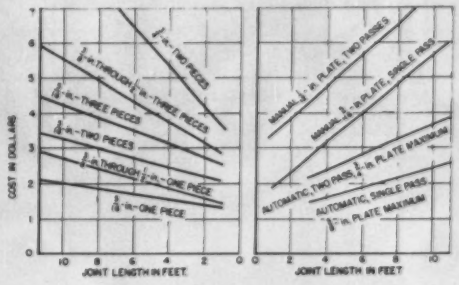
Geometry—Don't forget the fundamentals (a triangle is stronger than a rectangle). Worthington had a ladder-style bed plate for one of its machines—a common construction form. Using an X-member in place of the crossbraces saved 60 per cent of the steel, reduced the weight from 870 to 350 lb, cut welds 25 per cent.

Don't use heavier metal to get stiffness. And don't use angle irons welded to the sides. Use embossments.

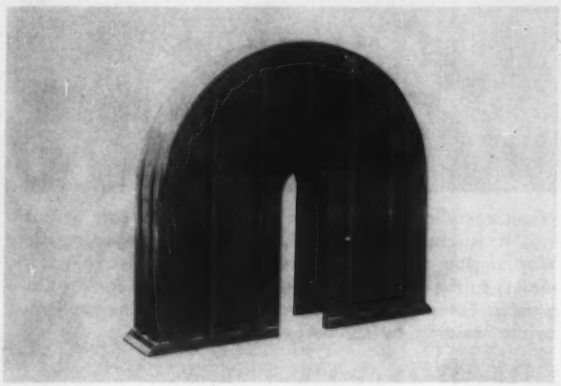
Good examples are pulley guards, fan and flywheel housings. Worthington finds that raw material cost is important. Corrugations and embossments are easy to press and pay for themselves several times



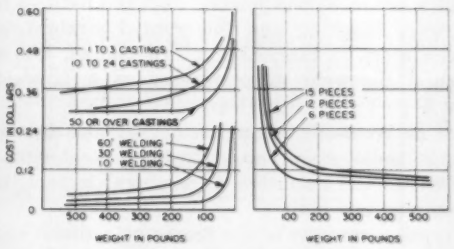
pistons adjust the floor to almost any angle for the automatic arc welder (Harrison gantry)



This comparison of bending (left) with welding (right) demonstrates that most bends are cheaper than a weld. Costs include crane handling, labor and overhead



You can save weight and money by using lighter metal, embossments and corrugation. Worthington cut costs 20 per cent on this large fan pulley housing



Cost of casting vs. welding: These charts are based on castings purchased outside; weldment costs are those within the plant: Labor, plus overhead, is $6.50 an hour, weighted 80 per cent automatic, 20 per cent hand welding. To calculate the cost of a weldment, use $0.63 per pound of material, add fabrication costs from the lower, right curves, plus welding costs from the lower left-hand curves. Compare the result with the cost of a substitute casting in the upper, left curves. Using this chart, it's easy to tell that steel castings below 50 lb frequently are cheaper than weldments

When complicated, precision coring ups the cost of casting, it is cheaper to weld. Take this large impeller. Worthington tacks the vanes (shell-molded castings or plates) to the top shroud, uses it as a pattern for an Oxygraph. Bottom, torch-cut shroud is shown in the preheater before welding by submerged arc (Mig)

over. Curved members are corrugated when the plate is flat. A bushing on the top roll of a standard 3-roll bender provides clearance. One example (see photo, page 133) is 20 per cent cheaper than heavier plates welded together.

Warp—There are many texts that supply formulas for the warp in welded joints. Jigs and fixtures minimize warp; tacking and interrupted straight welds do even more in fabrications. Of course, it's wiser to use a buttweld in preference to a lapweld—it warps a part five times less.

Cast or Weld—Worthington has its own foundries. Castings must stand up costwise. Weldments are not used to the exclusion of castings; in fact, many fabrications use both.

A typical example is the frame of a diesel engine. Cast, it weighs 36,500 lb; the weldment weighs 14,600 lb—60 per cent less. Steel castings are used for the main arc members (crankshaft bearing supports) as well as the camshaft bearings.

The design uses bending and corrugations throughout. The camshaft box, for instance, has four bends that eliminate several welded joints. The opposite camshaft side cover is made from a single plate with two bends and a corrugation. The corrugation dampens sound, makes a quieter engine, reduces the possibility of vibration fatigue cracks.

Positioners—Automatic welding equipment finds its way into most of the specifications from the lab. It lays out the plan view of the weldment, shows the outline of the equipment used for each weld and its location. Positioners are shown, as well as jigs, fixtures and weld specification.

Generally, the amount of weld metal deposited increases with the thickness of the metal being joined. Fewer passes with larger wires or even rods are preferred. Worthington has some automatics that use ¼-in. rods.

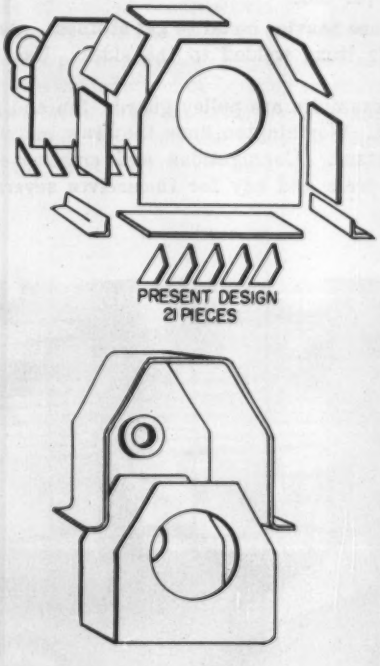
The only limitation to wire size is weld quality. The wire or rod must be small enough to reach the root of the joint; electrodes that are too large produce bridging and entrapment of slag which causes stress risers and porosity.

Automatic welding is considerably cheaper than hand welding. Two-wire automatics do an excellent job of bridging over poor fitups, producing better grain and a more ductile nugget.

In a few applications, semiautomatics (submerged) are more economical. Not the least feature of both is their economical use of electrodes. Hand welding frequently takes too much weld metal.

Even a modest lab staffed with one or two qualified engineers can bring substantial returns if your operation isn't using the latest welding techniques.

• *An extra copy of this article is available until supply is exhausted. Write Editorial Service,* STEEL, *Penton Bldg., Cleveland 13, O.*



Weldment design suggestions like this one are the difference between success and failure. Twenty-one pieces were reduced to three by using bending. Saving: 80 per cent

CHASE® NICKEL LEADED COMMERCIAL BRONZE

For making STRONGER PRODUCTS *that have to be machined!*

This is the high-strength leaded commercial bronze you have been looking for! It has *27 percent higher tensile strength, 20 percent higher yield strength* than Leaded Commercial Bronze, yet has a machinability rating that is 80% of that of Free-Cutting Brass.

Chase Nickel Leaded Commercial Bronze is a moderately priced alloy for making longer-lasting pole line hardware, electrical fasteners, nuts, bolts, and other bronze products that require added strength. Order Chase Nickel Leaded Commercial Bronze today. It's available in rod form—round sizes from ¼" to 1" diameter, hexagonal sizes from ¼" to ⅞".

"IN THE CHIPS"—a Chase movie showing Brass Rod and Wire *at work*. Every machine shop can benefit by showing it. Loaned free on request.

Chase

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta • Baltimore • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Grand Rapids • Houston • Indianapolis • Kansas City, Mo. Los Angeles • Milwaukee • Minneapolis • Newark • New Orleans • New York • Philadelphia • Pittsburgh • Providence • Rochester • St. Louis • San Francisco • Seattle • Waterbury

US Sand Blast Hose

Dissipates Static Electricity as no other hose can!

Blasting with either sand or steel shot can build up a static electrical discharge so potent that the operator cannot handle the hose. In extreme cases the hose wall may even be perforated by this man-made form of lightning. An exclusive construction makes U. S. Sand Blast Hose *conductive*—and (more thoroughly than any other hose) prevents static build-up.

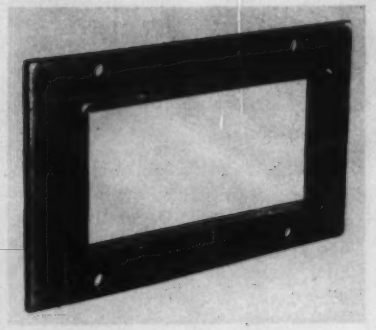
The strong carcass is built to handle any required pressures—is rigid enough to hold its shape, yet is always flexible for easy handling. High-grade rubber cover resists abrasion. Tube has the high abrasion resistance so essential in steel and shot blasting.

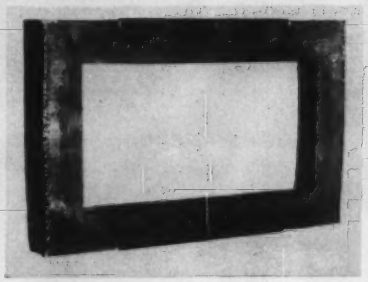
Obtainable at any of the 28 strategically located "U. S." District Sales Offices, or write Mechanical Goods Division, United States Rubber, Rockefeller Center, New York 20, New York.

US RUBBER

Mechanical Goods Division

United States Rubber





The radar tube wave guide is coined in a single operation from the blank. Coining holds dimensions within 0.005-in.

Coined Flange

This award winning idea may be the short cut that will solve your tough machining job

INSTEAD of forging and machining the piece, perhaps you can coin it. That's what the Lord Machine Co., Waltham, Mass., did; it expects to save nearly $74,000 this year.

This company makes a wave guide flange for radar tubes. The flange once was machined from a solid piece of steel. In an attempt to cut costs, it was made from a drop forged blank, machined and broached.

Coining has eliminated all the machining except a preliminary grind on one side. The final piece is held within 0.005-in., with a satisfactory surface finish.

Wins Award—The coining idea won the 1956 John Woodman Higgins award for Francis B. Lord, owner of the Lord Machinery Co.

Each year, the Pressed Metal Institute, Cleveland, gives the $500 prize to encourage outstanding work. The award was established by the Worcester Pressed Steel Co., Worcester, Mass.

This Quick Demonstration At Your Desk Will Prove

How To Get Better, Economical Fastening With Townsend Lockbolts

A few minutes of your time invested in watching a simple demonstration of a better fastening method may point the way to savings of thousands of dollars in assembly of your products. The Townsend lockbolt provides a quick method of producing tight, rigid fastenings that cannot loosen even under extreme vibration or shock conditions.

We would like to have a Townsend engineer demonstrate to you and others in your organization how these lockbolts combine the advantages of riveting and bolting—eliminate the disadvantages. He will show you that installation is fast—that fewer workers can complete an assembly in less time—you improve your product—achieve a lower installed cost.

You will be able to see why the clamping action, or clinch, of Townsend lockbolts is higher than rivets—is more uniform than bolts and nuts. The demonstration will explain how the lockbolt fills the hole better than other fasteners—makes possible a more rigid joint and provides an effective liquid seal.

Townsend lockbolts are available in steel and aluminum alloy, in 3/16", 1/4", 5/16" and 3/8" diameters, in grip length ranging up to 2", in various head styles.

For a demonstration on how to speed production, get tight, secure, permanent fastening with Townsend lockbolts write on your company letterhead to Townsend Company, P.O. Box 237-C, New Brighton, Pa.

Licensed under Huck patent nos. RE 22,792; 2,114,493; 2,527,307; 2,531,048; 2,531,049.

THE FASTENING AUTHORITY

Townsend

COMPANY • ESTABLISHED 1816

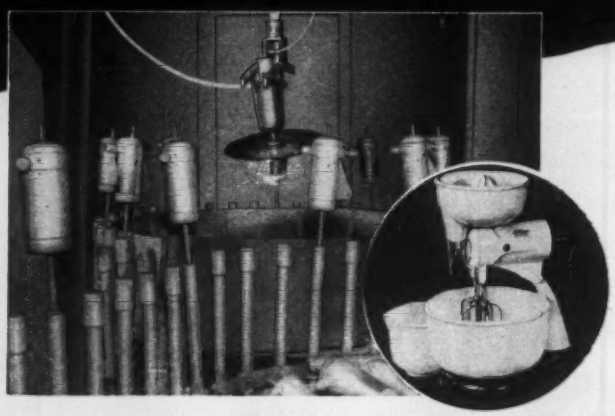
NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

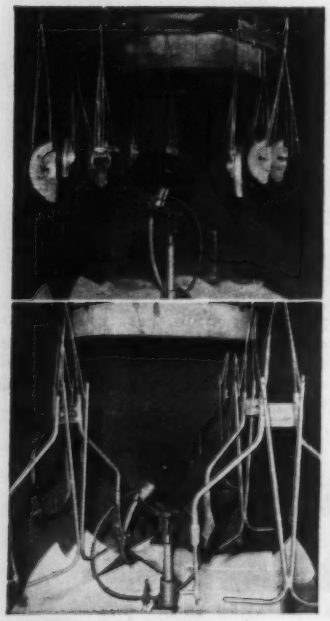
Cherry River Division • Santa Ana, California

In Canada: *Parmenter & Bulloch Manufacturing Company, Ltd., Gananoque, Ontario*

Sunbeam is particular about the uniform high quality finish on their products, so SUNBEAM relies on RANSBURG NO. 2 PROCESS Electrostatic Spray Painting



Along with improving the quality of the brilliant white finish on Mixmaster parts, an 80% paint savings was achieved when SUNBEAM switched from hand spray to RANSBURG Electrostatic Spray Painting



Protective clear lacquer is applied to upper saw guard (upper left) with RANSBURG NO. 2 PROCESS on this line in SUNBEAM's plant 2, Chicago. Other hardware items, including the Drillmaster and Sunbeam Sander are lacquer-coated electrostatically here. Lawn mower parts, such as the handles shown (lower left), the Rain King lawn sprinkler base, and the Sunbeam Fryer base also are painted efficiently with Ransburg No. 2 Process Electro-Spray.

Regardless of the type of product you manufacture, if it's painted—and if your production justifies conveyorized painting—you should look into the savings and improved quality which can be yours with one of the Ransburg Electrostatic Processes. May we tell you about complete Ransburg services, including the test painting of your products in our laboratories?

Write to Dept. S.

Ransburg ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

'Tune-In' Drilling

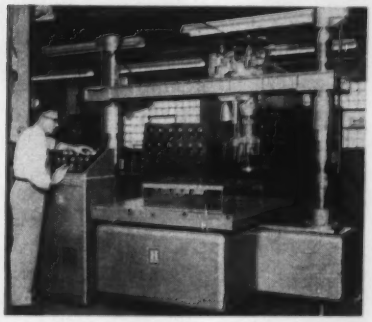
Pushbutton drilling of custom control panels is set up by turning the dials

FARWELL METAL Fabricating Co., St. Paul, has an electronic control system for drilling machines that makes drilling holes in panel board as easy as tuning a TV set.

Developed by Minneapolis-Honeywell Regulator Co., the control system lets the operator "dial" the "X" and "Y" coordinates in a hole location and drill by pushbutton.

Special Machine—The control is mounted on a special machine built by Farwell to drill holes for mounting instruments and dials on master control panel boards.

The drilling machine has a traveling head and movable table. Both can move up to 4 ft perpendicularly, permitting any point in a 4 x 4 ft area to be machined. Step methods allow handling larger sheets.



ROBOT DRILL

. . . drills panel for master control unit

The drill head has a multiple-spindle attachment. It can drill up to five holes of varying dimension simultaneously, with an accuracy of 0.005-in. A variable speed motor powers the spindles. Use of a belt reduction permits sawing or fly-cutting holes up to 6 in. in diameter.

The table and drill head are positioned by servomechanisms, controlled by dials on the control console. Other controls provide for jogging all machine motions, control of spindle speed, sequence of drilling operations and permit choice of constant feed or constant thrust drilling. Indicator lights show location of head and table relative to "called-for" position.

Manual Arc Welder Uses Carbon Dioxide Shield

The C-OMANUAL features the speed of automatic units and low-cost tooling.

This compact, portable machine contains a hand gun, control unit and a 600-amp, dc power source. Like this company's automatic welder, it uses inexpensive carbon dioxide gas to shield the arc.

Economies: Carbon dioxide costs about 1 cent a cubic foot, compared with almost 7 cents for helium and 9 cents for argon. The carbon-dioxide process is for mild or carbon steel welding applications where a high degree of automatic operation is desirable.

The manual welder offers these advantages: 1. Automatic current control compensates for all operator variations of arc length. This eliminates back burning and stubbing. 2. The process combines deep penetration and high metal deposits with sound quality, high strength and ductility. 3. A visible arc speeds the spotting of the nozzle for faster easier welding. No flux is needed and subsequent slag removal problems are eliminated, giving clean, nonporous welds. 4. Wire speeds go to 600 ipm.

The C-OMANUAL has a new, lightweight hand gun which is easy to use, simple and rugged in design. It has no O-rings, eliminating a major source of leaks and maintenance problems.

The portable control console contains a two-speed

automatic head which allows the operator to select proper feeds for light or heavy wire.

It also contains a wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections. *Write*: Welding Products Division, A. O. Smith Corp., Milwaukee, Wis. *Phone*: Uptown 3- 3000

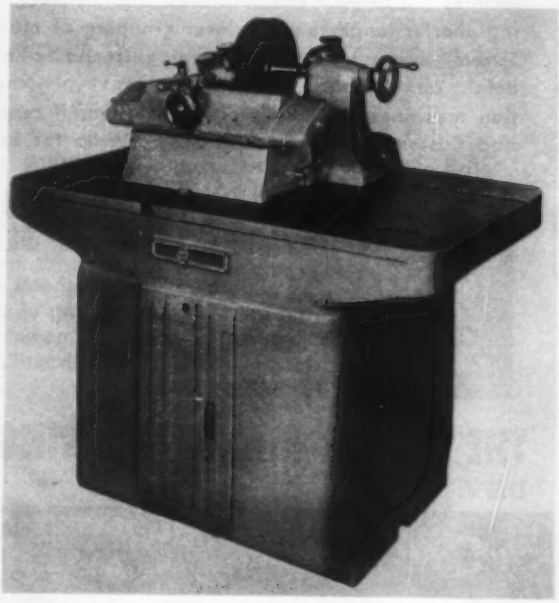
Checker Inspects Large Spur Gears and Splines

The Red Ring Model SIC, 24-in. gear checker inspects spur gears (up to 25½-in. OD) and splines for accuracy of tooth size, spacing, eccentricity and parallelism. Spur gears and splined parts up to 11⅜-in. between centers can be handled.

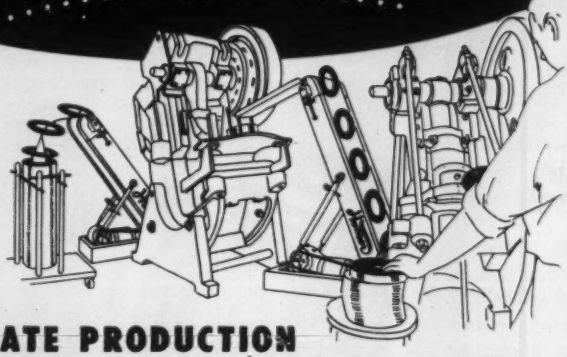
A main feature is the slot design in the table surface which permits the positioning of checking units in precise straight lines and right angles. The slot has a combination of straight and angular sides which make for built-in accuracy, improved hold-down power and reduced wear.

Gears are mounted between centers on head and tailstock units. Interchangeable heads allow checking eccentricity and size, and tooth-to-tooth spacing.

Parallelism is checked by a double indicator head unit mounted in front of the part; eccentricity and size are gaged by an indicator unit at the rear of the part; tooth-to-tooth spacing is measured by replacing the eccentricity and size indicator unit with a tooth spacing head. *Write*: National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. *Phone*: Walnut 1-8980

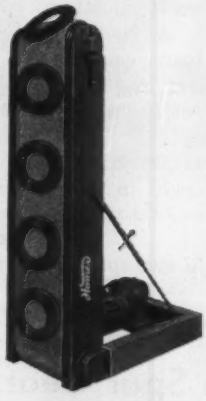


HOMER MAGNETIC CONVEYORS AND MAGNETIC SHEET SEPARATORS



AUTOMATE PRODUCTION
CUT LABOR COSTS—REDUCE REJECTS
in handling ferrous parts and scrap

Homer "Space Saver" Permanent Magnetic Conveyors cut costs by automatically feeding machines . . . stacking parts . . . transferring parts between machines . . . and performing parts turn-over and other handling operations.



"Space Savers" convey ferrous parts at angles up to 90° without belt cleats, buckets or holding devices. The powerful magnetic assembly securely holds and conveys—ends loss of parts from belt as a result of belt resilience or bouncing over belt cleats—prevents damage to critical finishes caused by parts riding against cleats or jamming in flapper gates.

"Space Saver" Conveyors save floor space because their steeper inclines (up to 90°) without nosed-over delivery . . . and resulting shorter length permit closer grouping of machinery. "Space Savers" have outstanding loading flexibility—any angle, any height above floor . . . from other conveyors, chutes or production machines. Pick up pieces from floor if required. Standard and Custom models available . . . Write for Bulletin MC-250.

HOMER PERMANENT MAGNETIC SHEET SEPARATORS

Speed handling of steel sheets and pieces. Prevent scratching or marring of surfaces in handling. As each piece is removed, next piece rises clear of stack for easy handling. Write today for Bulletin SS-210.

THE HOMER MANUFACTURING CO., INC.

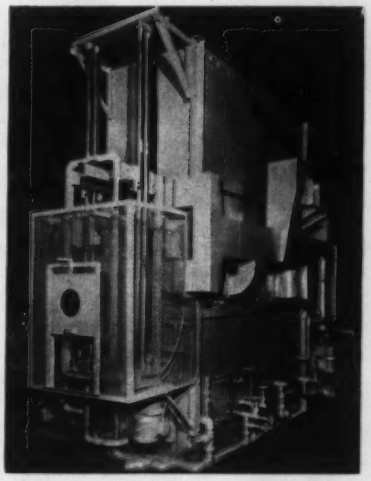
DEPT. 149 **LIMA, OHIO**

HOMER FIRST IN INDUSTRIAL PERMANENT MAGNETIC CONVEYORS

NEW PRODUCTS and equipment

Automatic Degreaser

The Hydro-Lift picks up a basket of parts to be degreased, immerses them in solvent vapors and transfers them to successive cleaner sprays of chlorinated solvents. A vapor rinse and drying follow.

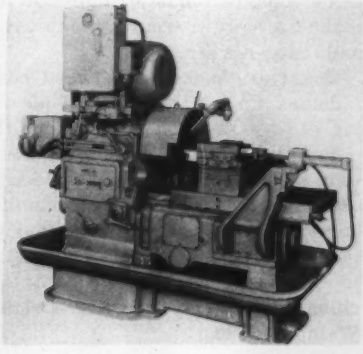


Work may then be coated with filtered rustproof oil and discharged to an assembly area. *Write*: Detrex Corp., Box 501, Roosevelt Park Annex, Detroit 32, Mich. *Phone*: Townsend 8-8600

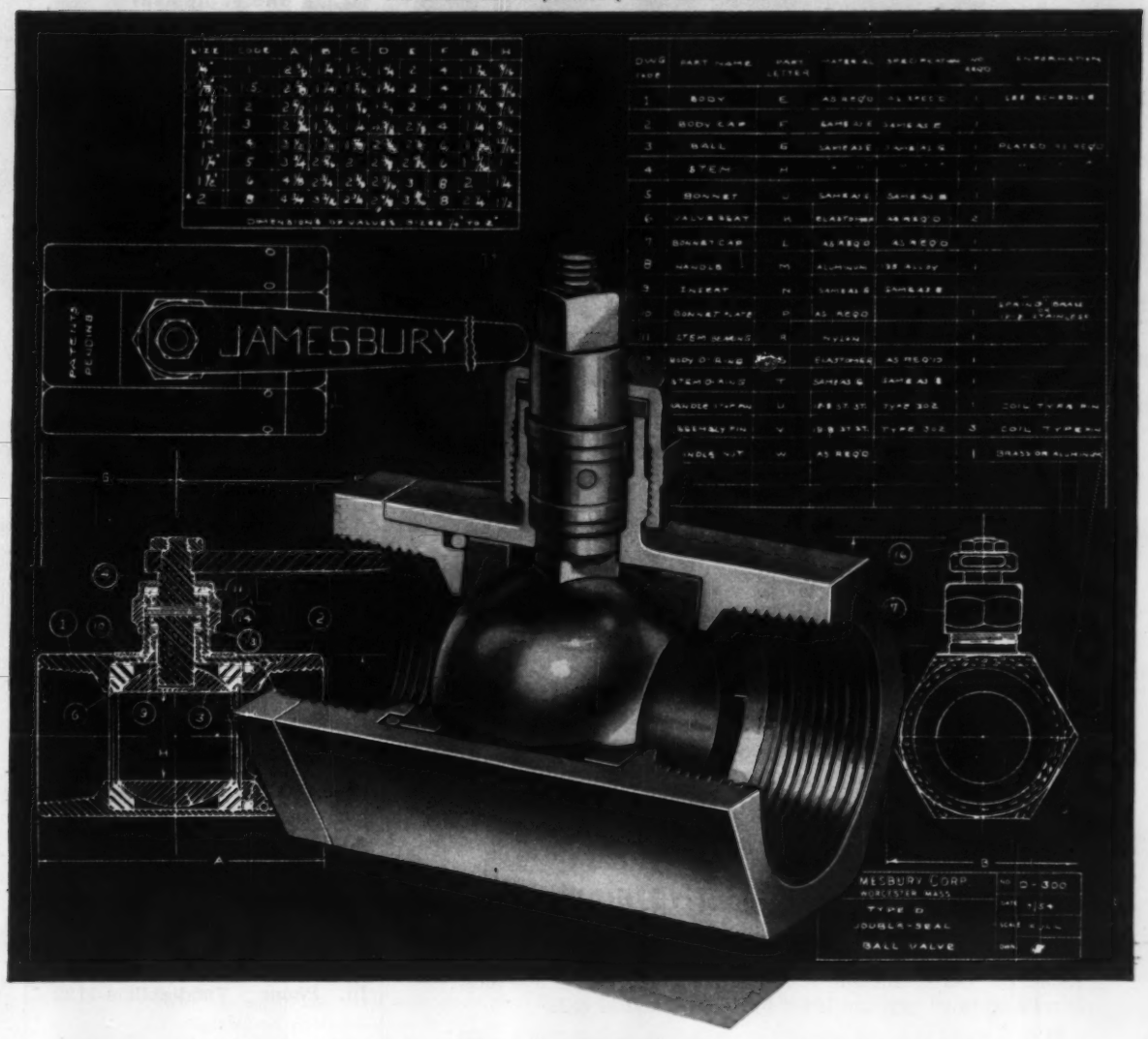
Platen-Type Lathes

Three new automatic lathes are designed to be used principally as chucking machines for work requiring large swing capacity, high spindle speeds, multiple tooling and fast cycling operation. All three can be equipped with automatic loading and transfer equipment.

Tool blocks are mounted on a power-operated cross slide. Its



New, all-stainless double-seal ball valve. Its manufacturer, JAMESBURY CORPORATION, Worcester, Mass., stresses its straight-line flow and elimination of practically all maintenance.



STAINLESS means corrosion-resistance in new double-seal ball valve...

The *all-stainless* construction of this new-type, double-seal ball valve means exceptional resistance to corrosion, erosion and abrasion. That's part of the reason why these Jamesbury valves are being used for chemical applications... processing of hot caustic solutions... even for the vacuum fields.

The valve differs from conventional globe or gate valves in that its operation depends upon a stainless steel ball, sealed with a plastic or rubber ring on both sides. All of the valve, including the ball, is machined from Crucible stainless bar stock, type 303 or 316.

Stainless may be the answer for your product, too. Why not let a Crucible engineer give you the facts concerning its most profitable use? *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

ARDCOR

selects dependable, easy-to-maintain H&S speed reducers to drive giant mills.

Designed to roll form steel roof decks and flooring by American Roller Die Corp., this mill is 180 feet long and weighs 300 tons. It rolls up to 90 fpm and is fed by 12,000 lb. steel coils.

H & S speed reducers are key units in this Ardcor mill's main drive system. An eight speed H & S transmission equipped with Sykes Herringbone Gears and accurate shifting mechanism is coupled by high speed shafts to pinion stands. These H & S roll drives feature a combination of worm and helical gearing. The helical gears have a ratio of 1-1 with roll shafts.

Years of experience prove that *rugged construction* and *ample overload capacity* of H & S products assure trouble-free service and operating economy. If you have a power transmission problem, we'll be glad to help you. With our complete lines to choose from, you're assured of our unbiased recommendation. Contact your H & S representative, or write us today.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

Send note on Company Letterhead for complete H & S Catalog

movement is controlled by a quick-change-over mechanism which eliminates the necessity of changing cams for variations in stroke length. The cross slide base is keyed and bolted to the platen and is adjustable longitudinally by T-slots. Automatic longitudinal feed for the platen is through a barrel cam housed in the bed.

Model N has a swing of 11 in. over the platen; Model LN (see photo) has an 18-in. swing and the Model AN has a swing of 24 in. Their power capacities are 5, 20 and 40 hp. *Write*: Seneca Falls Machine Co., Seneca Falls, N. Y. *Phone*: Seneca Falls 701

Black Granite Plates

These surface plates range from 8 x 12-in. toolmakers' flats to 72 x 144-in., one-piece layout tables. Larger table areas can be obtained by joining several granite tables with special stands.

Advantages of granite: A hardness greater than steel; extreme rigidity; velvet smoothness; dull, nonglare finish; nonrusting, noncorroding and nonmagnetic; and low cost.

Accessories include granite straight edges, parallels, chuck platforms and angle plates. *Write*: DoAll Co., Des Plaines, Ill. *Phone*: Vanderbilt 4-1122

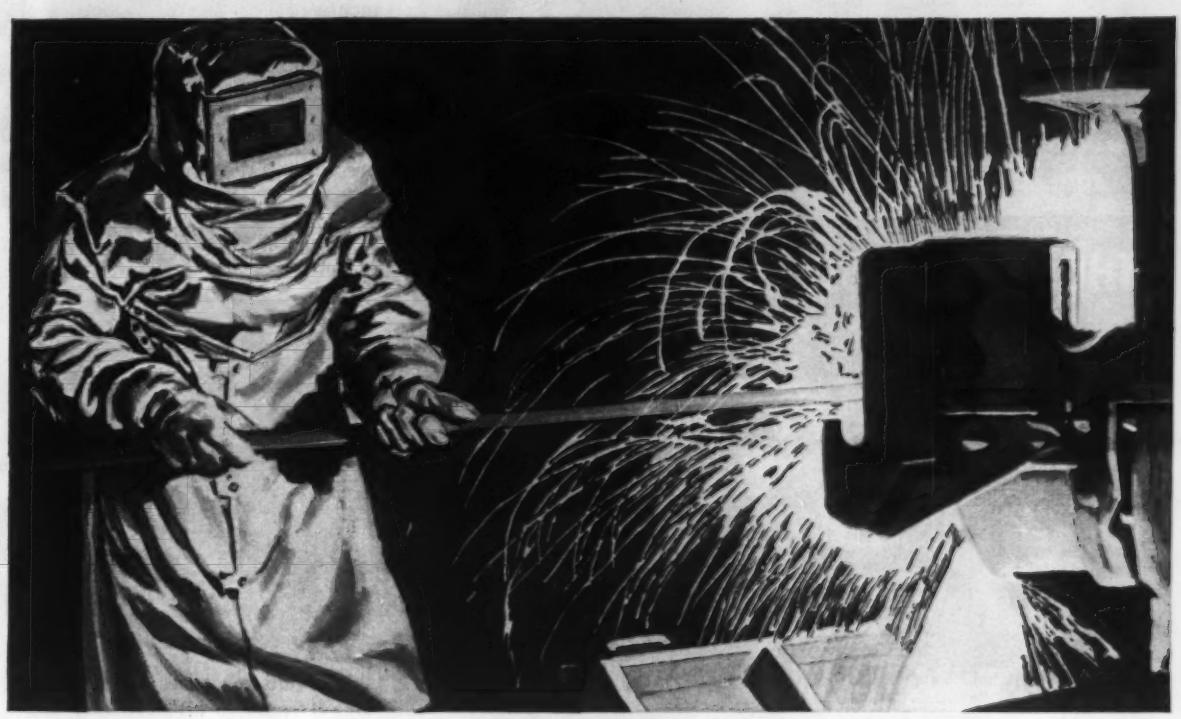
Wheel Face Grinder

Precision grinding of long or bulky workpieces at 90 degrees to the wheel face is easy with the UK traveling wheel face unit. These heavy-duty production machines have been improved to provide greater horsepower for heavier stock removal and a heavier carriage for improved precision.

The part is clamped in a stationary position, and the grinding wheel passes over the surface to be ground. The stationary table permits the use of fixtures and clamps as heavy as the work demands.

Carriageways are one - third longer and wider in the redesigned machines. The carriage is driven

Now! New Safety Fabric takes up to 3000° F. without flinching!



"3M" heat-reflective fabric cuts production downtime 75%
...lets you make furnace repairs without shutdown!

Now, *one* helper can work in front of the door during slag-off operations *for the full time!* No relief needed. Now, you *stop* costly furnace shutdown for repairs . . . men in this new equipment have changed the doors on ingot reheating furnaces with the furnace *operating* at 2100° F.!

Here's the amazing safety fabric engineered for the steel industry! It's *new* . . . it's lighter-weight . . . it's cooler . . . it's safer . . . and men in the hot spots *like to wear it!* It's the "3M" aluminized fabric clothing . . . the perfected safety suit that *reflects over 90% of radiated heat!*

New "3M" heat reflective clothing is spatter-shedding . . . won't gain weight. The light (4 lb.) coats, half the weight of older types are *more* flexible, *more* comfortable . . . give workers more freedom of movement. And they *last from 30 to 50% longer* than old-fashioned, cumbersome gear. A complete line—gloves, aprons, helmets, suits, coats, etc.—is available.

Get the facts now! Send the coupon below for full details and personal demonstration.

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Aluminized Fabric

3M COMPANY

The term "3M" is a registered trademark of Minnesota Mining & Mfg. Co., St. Paul 6, Minn. General Export: 99 Park Avenue, New York 16, N. Y. In Canada: P.O. Box 757, London, Ontario.

Minnesota Mining & Manufacturing Co.
Dept. KD-46, St. Paul 6, Minn.

Send details on money-saving, burn-stopping "3M" aluminized fabric suits and arrange for my personal safety demonstration.

Name_____

Company_____

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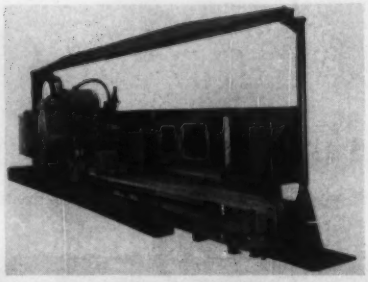
by a variable volume piston-type hydraulic pump. A vane-type fluid motor is used. Control of all machine functions is governed by a servomechanism. Rate of speed, start, stop, inching and positioning for unloading are pushbutton controlled at the operator's station on the traveling wheel carriage.

In grinding the vertical column of a machine, flatness has been



held to within 0.0004-in. over a 60-in. surface. *Write*: Mattison Machine Works, Rockford, Ill. *Phone*: Rockford 2-5521

Fog Lubricator

The Micro-Fog Lubro-Control unit automatically creates a finely divided air-borne fog which can be distributed uniformly through complex piping systems to multiple lubrication points. A single unit can lubricate up to 1000 bearing-inches.

Two pressure switches and a float-controlled switch are provided. Connected to a control panel, they will actuate an automatic alarm system or controls when air pressure fails, when excessive pressure develops in the oil reservoir or when the oil supply needs replenishing.

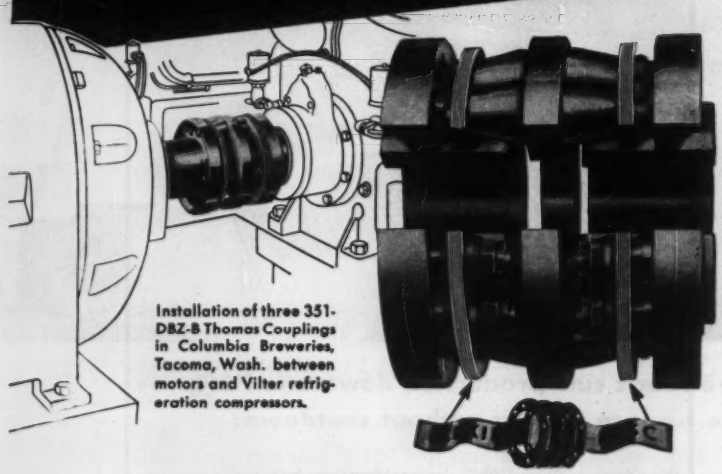
The unit measures 12 x 11 x 9 in. It contains all necessary controls, plus a 2-gallon oil reservoir —enough for 12 hours of lubrication at maximum output. An automatic drain filter protects the unit, the lubricant and bearings by removing abrasive and corrosive line contaminants. It drains collected liquids automatically. A solenoid valve co-ordinates operation of the lubricator with starting and stopping of the machine. *Write*: C. A. Norgren Co., 3400 S. Elati St., Englewood, Colo. *Phone*: Sunset 1-5583

Portable Lift

The 1000-lb capacity, telescoping lift can be used as a straddle fork truck, portable elevator or shop crane. The full lift is 112 in., but the collapsed height is low enough to allow the unit to be used in freight cars and highway trucks, in elevators and under balconies.

Batteries can be charged from

THOMAS FLEXIBLE COUPLINGS...
for more years of better service!

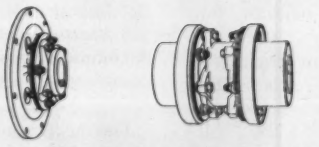


Installation of three 351-DBZ-B Thomas Couplings in Columbia Breweries, Tacoma, Wash. between motors and Vilter refrigeration compressors.

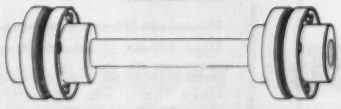
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.



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THOMAS FLEXIBLE COUPLING COMPANY
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WARREN, PENNSYLVANIA, U.S.A.

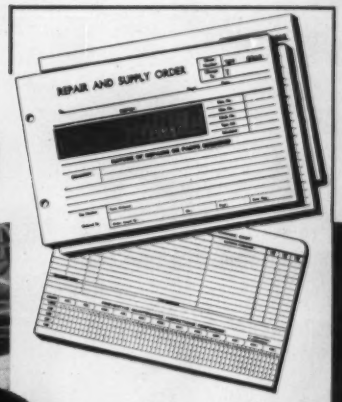
You save when you specify JESSOP stainless clad steel

If you fabricate any type of large vessel which requires the protection provided by stainless steel, it will pay you to investigate Jessop's famous stainless clad plate for several very good reasons. First: you save money and vital alloys—stainless cladding is from 5 to 50 percent on a mild steel backing. Second: you get quicker delivery. Third: you enjoy easier fabricating. Also, you can depend on the bond between the steels remaining intact. Twenty years ago, Jessop pioneered stainless clad and its patents are still superior. The degree of cladding is always guaranteed. Last, but far from least, you will be doing business with an organization dedicated to good products and good service—a team that considers satisfied customers its most important asset. Write to us.

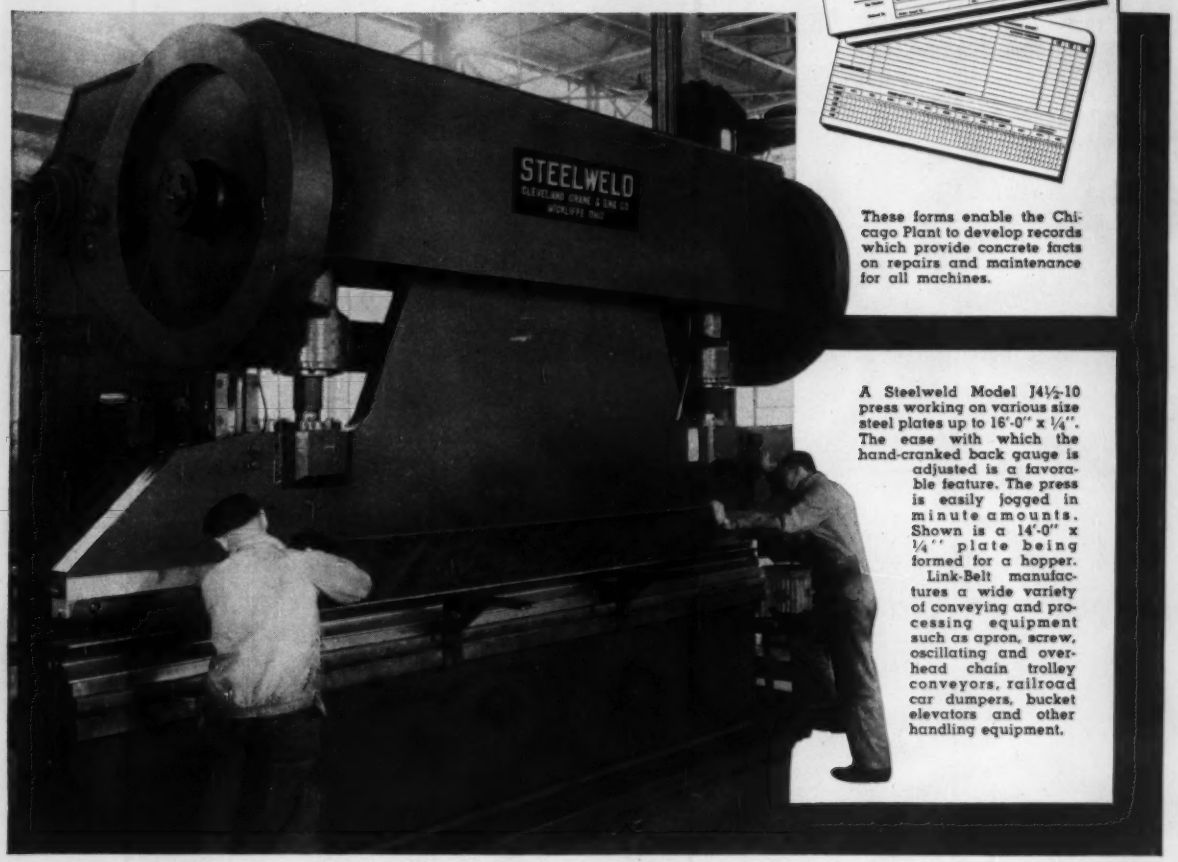
JESSOP

STEEL COMPANY · WASHINGTON, PENNSYLVANIA

Accurate Records Prove
LOW COST OPERATION



These forms enable the Chicago Plant to develop records which provide concrete facts on repairs and maintenance for all machines.



A Steelweld Model J4½-10 press working on various size steel plates up to 16'-0" x ¼". The ease with which the hand-cranked back gauge is adjusted is a favorable feature. The press is easily jogged in minute amounts. Shown is a 14'-0" x ¼" plate being formed for a hopper.

Link-Belt manufactures a wide variety of conveying and processing equipment such as apron, screw, oscillating and overhead chain trolley conveyors, railroad car dumpers, bucket elevators and other handling equipment.

SOME YEARS AGO the Pershing Road Plant of Link-Belt Company, Chicago, established a record system for keeping track of repairs and maintenance costs of all machine tools. This system provides a detailed history of maintenance required and lists every item of expense for every machine.

The record system proves that the maintenance cost for Steelweld machines, both bending presses and shears, is comparatively low.

Because of this, and the fact that Steelweld machines have many desirable operational features, a number of which are unavailable elsewhere, Link-Belt regards them highly. In fact, so much that 20 Steelweld Presses and Shears are now serving Link-Belt plants in nine cities.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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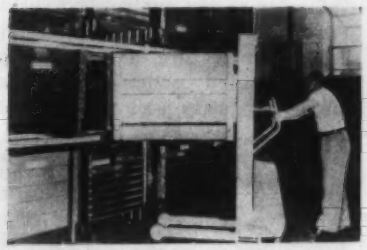
BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

NEW PRODUCTS and equipment



any 110-volt outlet. The unit has a turning radius of 60 in. *Write*: Oster Mfg. Co., Box 4326, Cleveland 32, O. *Phone*: Wickliffe 3-3500

Abrasive Cleaning

Slow hand cleaning methods are replaced by the Educt-O-Matic. It is a self-contained abrasive cleaning tool that recovers all abrasive and dust.

Light weight makes the unit easy to use inside tanks, on ceilings and floors. It cleans before and after welds.

A ½-in. air line supplying 33 to 60 cfm is needed to operate the 11-lb unit. *Write*: Clementina Ltd., 2277 Jerrold Ave., San Francisco 24, Calif. *Phone*: Atwater 2-1429

High-Speed Lathe

Toolmakers, instrument makers, laboratory machinists and lathe operators can determine the correct spindle speed for a particular job quickly and simply on the DV59 high-speed lathe. Two push-buttons, one labeled "faster," the other "slower," vary spindle speeds from 230 to 3500 rpm. A speed

STOP
CORROSION
BEFORE
it starts
ESCO 0.03 MAX. CARBON STAINLESS CASTINGS
STOP CORROSION...EVEN AT THE WELD
Most castings must be welded to component parts during installation. This usually means "carbide precipitation" and resultant corrosion along the weld, unless unit is heat treated—an always difficult, sometimes impossible job.
ESCO 0.03 Max. carbon castings can be welded into working position without loss of corrosion resistance—even at the weld. Result: Dependable corrosion-resistant operation. A definite cut in operating costs.
ESCO will produce to your specifications one casting or an entire installation. Spuncast®, Shellcast and conventional casting facilities are available. Write for details.
THE TOUGHEST CORROSION PROBLEMS WIND UP AT...
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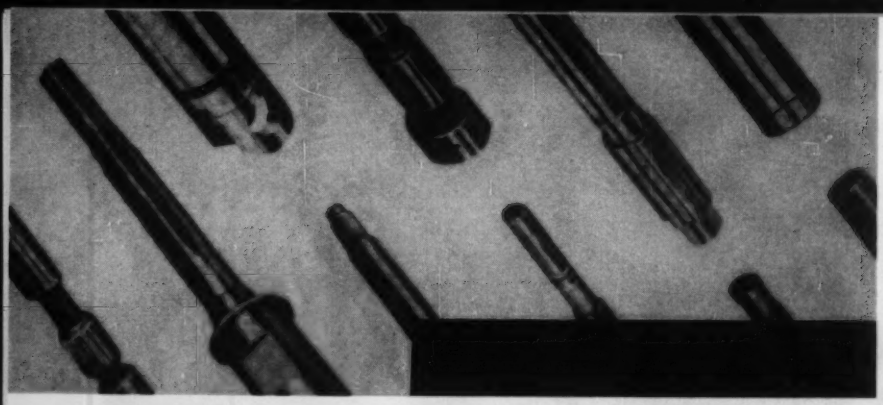
Houston, Texas
Eugene, Oregon
Salt Lake City, Utah
Honolulu, Hawaii
In Canada, Vancouver British Columbia and Toronto, Ontario



DOES YOUR PRODUCT

require hardened and ground screw machine parts?

At OTTAWA STEEL you'll find the result of 25 years of concentration on high quality standards.

Modern equipment and unique facilities achieve efficient, economical production in straight line operation. The result is PRECISION, from bar stock to component parts.

We prefer to serve careful clients. May we serve you?

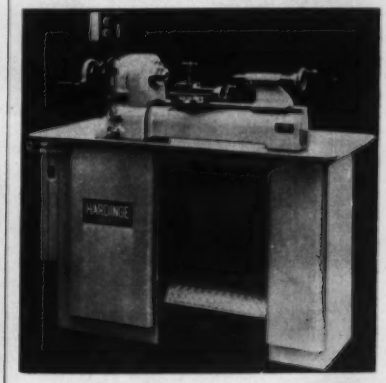
OTTAWA STEEL PRODUCTS, INC.
Grand Haven, Michigan

OTTAWA OSP INC. STEEL PRODUCTS

NEW PRODUCTS and equipment

indicator on the control box shows exact speed at all times.

Another feature, a ball-bearing, lever-operated collet closer, assures fast, easy and positive collet gripping. The operator can close a collet or step chuck while the machine is running. *Write*: Hardinge Bros. Inc., Elmira, N. Y. *Phone*: Elmira 6256.



Hardness Tester

This portable unit gives a direct reading in seconds—just place the tester on the metal, press the handgrips and read the dial.

The tester gives direct readings corresponding to Rockwell A, B or C scales or the medium or low Brinell scales.

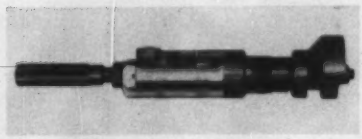
Each instrument is calibrated to ±1.5 points Rockwell and 5 points Brinell. *Write*: Newage International Inc., 222 York Rd., Jenkintown, Pa.

Rotary Air Grinder

Model 25G, a streamlined, lightweight, unit produces 23 per cent more power than former models in the No. 2 series. Designed primarily for precision die grinding, the unit weighs only 2 lb, is 11½-in. long and has a wheel of

1¾-in. bonded capacity. It operates at 20,000 rpm on 90 lb of air pressure.

Other features: Less working parts than former models, a 360-degree adjustable exhaust position



and a thumb-type throttle. Attachments for the 25G include mounted points, rotary files, steel cutters, soft felt and rubber polishers and wire wheels. *Write*: Thor Power Tool Co., Aurora, Ill. *Phone*: Aurora 2-7601

Automatic Air Valves

Improved two-way valves are designed for high-speed automation. They automatically eject stampings from punch presses and kick presses and provide an air blast for removing chips, dust and shavings in drill press, cold heading and machining operations.

The valves operate from any compressed air line without a filter. Both level and roller-type valves are available. *Write*: W. I. Martin & Co., 224 S. Michigan Ave., Chicago 4, Ill. *Phone*: Wabash 2-8040

Synchronous Motor

The Synduction motor offers several advantages over existing synchronous reluctance units, and approaches the efficiency and power factor of squirrel-cage units. It starts as an induction motor with high locked-rotor torque, accelerates and pulls into synchronism quickly.

The motor operates over a wide frequency and speed range. Fre-

there's only one MALLEABRASIVE!

Since 1939, when the introduction of Malleabrasive revolutionized blast-cleaning, there has been only one MALLEABRASIVE!

MALLEABRASIVE was developed through exhaustive research. Its leadership has been maintained through continuing research and improvement.

- Today there is still only one genuine MALLEABRASIVE.
- MALLEABRASIVE has no exact counterpart—there is no other product exactly like it.
- MALLEABRASIVE is patented because of its own distinctive metallurgical characteristics.
- MALLEABRASIVE is produced only by manufacture under the full and complete MALLEABRASIVE process—used by Globe exclusively.

The qualities that make Malleabrasive distinctively different have made it the most widely used premium abrasive in the world today. In hundreds of plants it has made important reductions in blast-cleaning costs. Undoubtedly it can do the same in yours. At least, why not investigate its possibilities? Write us.

THE GLOBE STEEL ABRASIVE COMPANY
MANSFIELD, OHIO
Subsidiary of Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Also sold and recommended by Pangborn Corp., Hagerstown, Md.

MALLEABRASIVE®

STAYS ON THE JOB

Continuously good service has always been dominant in building "Shaw-Box" Cranes of every type and capacity. The complete dependability of every part — from end trucks to load hooks — gives owners a bigger return over the years than "crane dollars" ordinarily buy. Advanced design and engineering and precision manufacture assure all-around safety, economical performance, and convenient, money-saving maintenance.

Shaw-Box originated many construction and operational features now generally accepted as standard in crane manufacture. The same creativeness is constantly evolving new "firsts" to provide even greater crane efficiency and long-life economy for every purchaser.

Shaw-Box offers the greatest variety of standard cranes available from a single source. Capacities range from 500 lbs. to 300 tons or more. So, plan for better crane service today and for years to come. Turn to Shaw-Box. We will gladly cooperate with your engineering consultants or your own staff. Your inquiry is invited. Write for Catalog 219.

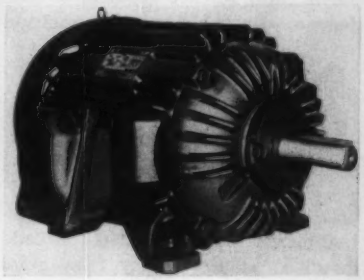
"Shaw-Box"® CRANES

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Makers of 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

NEW PRODUCTS and equipment

quencies of 300 cycles and speeds above 10,000 rpm are available. Motors for frequencies as low as 10 cycles have been developed.



Units are available in ratings from ¼ to 40 hp, built on standard induction motor frames and enclosures. The photo shows a totally enclosed, fan-cooled type. *Write*: Norwood Works, Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. *Phone*: Spring 4-3600

Tracer Milling

The stylus arm has several mounting positions, and the ram support has keyways for mounting. Cuts can be made on large pieces by moving the cutter rather than the work.

The cutter can move 12 in. in a horizontal plane. Its depth movement is 8 in. Duplicating speed of the cutter is variable from 1 to 50 ipm. *Write*: Sundstrand Machine Tool Co., Rockford, Ill. *Phone*: 2-4477

Grinder

A dust control system is built into the base of the Grind Air-rester. It has a materials handling fan which operates simultaneously with the grinder motor.

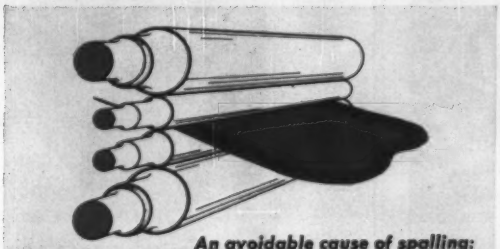
The 2GAR has a 2-hp grinder motor to serve two 2-in. wheels,

TIPS FROM A ROLL MAKER'S NOTEBOOK

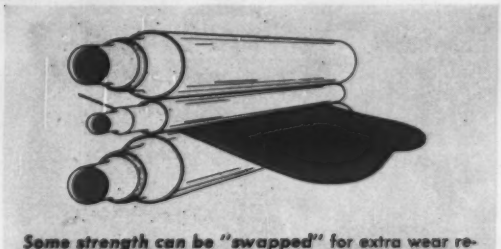
MACKINTOSH-HEMPHILL DIVISION, E. W. BLISS COMPANY, Pittsburgh 3, Pennsylvania

Cast mill rolls • Johnston cinder pots • rotary tube straighteners • end-thrust bearings • heavy-duty lathes • steel and special alloy castings

How to get longer life from plate mill work rolls



An avoidable cause of spalling: Uncropped "cold" edges and sides "bruise" rolls by causing over-stressing at the edges. Sub-surface fatigue cracks develop in these areas and roll starts to spall.

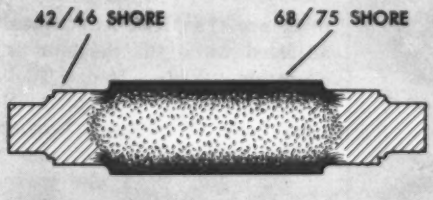


Some strength can be "swapped" for extra wear resistance in the middle roll of a 3-high mill, which gets approximately three times as much wear as the top and bottom rolls.

In plate mill work rolls, the balance of strength-vs.-hardness varies with the type of mill, the stand, and the rolling stresses involved. In general, however, the harder the rolls, the better.

This is particularly true of the work rolls in a 4-high mill and of the middle roll in a 3-high mill when used for finishing passes. On the other hand, the absence of grinding facilities in some plants often puts a limit on hardness, since the rolls must be soft enough to machine.

Spalling and fire cracking – With the many suitable combinations of mechanical properties available today, the life expectancy of a cast iron plate mill work roll depends largely on its resistance to fire cracking and spalling. And the current demand for good plate finish has placed even more emphasis on roll surface condition.



Triple-poured Nironite "F" roll, showing hardness ranges for the roll surface and the neck.

Three kinds of iron in a single roll – Mack-Hemp metallurgists have answered all these requirements in the *Nironite "F"* roll, a high-alloy grain-type roll.

Nironite "F" rolls are always double-poured, and sometimes even triple-poured. The deep outer shell is nickel-chromium alloy iron – very hard, very dense, and highly resistant to fire cracking. The second metal, a soft gray iron, provides the strength and resistance to impact needed in the core. Finally, the necks of all large Mack-Hemp plate mill rolls are cast with a third alloy whose carbon content is closely controlled. This third pour eliminates the tendency to weakness and coarse grain structure often encountered in the necks of double-poured plate mill rolls (a result of the slow cooling rate of the large mass of metal in the necks). It provides increased strength and a fine grain structure that prolongs the life of the roll neck bearings.

Another Nironite grade – *Nironite A* – is also widely used for work rolls in many plate mills. A single-poured cast iron grain roll of slightly lower alloy content than the iron of the first pour in Nironite "F" rolls, it provides excellent strength properties at somewhat lower hardness levels.

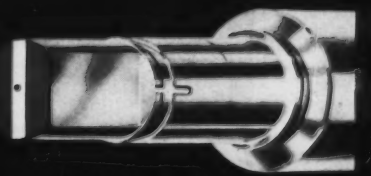
No matter what type of rolling you do . . . ferrous or non-ferrous . . . Mack-Hemp roll engineers and metallurgists can help you with your special problem. Simply write Mackintosh-Hemphill Division, E. W. Bliss Company, 901 Bingham Street, Pittsburgh 3, Pa.

MACKINTOSH-HEMPHILL

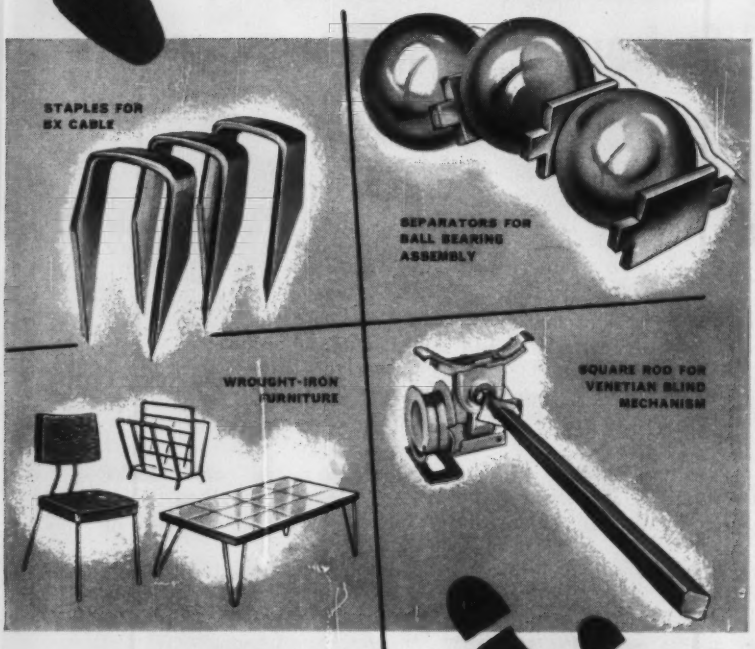
You get more tonnage from the rolls with the Striped Red Wabblers

Division of E. W. BLISS COMPANY

Presses, Rolling Mills, Special Machinery



CONTINENTAL®
FLAT & SHAPED WIRE SAVES STEPS


STAPLES FOR BX CABLE
SEPARATORS FOR BALL BEARING ASSEMBLY
WROUGHT-IRON FURNITURE
SQUARE ROD FOR VENETIAN BLIND MECHANISM

...cuts corners in production

• STANDARD AND SPECIAL SHAPES IN MANY SIZES

Shaped wire often saves steps by eliminating forging, stamping, and rolling operations—giving you a ready-made molding, product trim, or component that requires a minimum of further fabrication. Saves metal, too. From Continental you can obtain many cost-cutting wire shapes—V-shaped, oval, square, rectangular, triangular, keystone-shaped, and others.

• IN A WIDE RANGE OF TEMPERS AND FINISHES

Practically any temper, finish, or analysis in low carbon and medium low carbon steels can be specified to give you the *right* wire for the job—including #3 finish wire for electroplating.

• PRECISE MANUFACTURING CONTROL

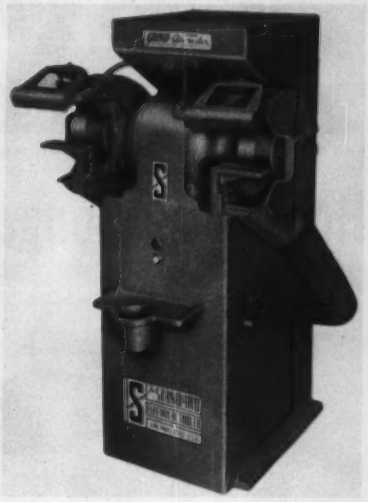
Continental Special Shaped Wire is made under strict quality control to assure uniformity. You get a better product and fewer rejects—qualities that Continental wire customers especially appreciate. Let us help *you* save production steps, too. Write for the complete story of Continental wire today.

Wire Specialists for over Half a Century

CONTINENTAL
STEEL CORPORATION • KOKOMO, INDIANA

PRODUCERS OF Manufacturers' Wire in many sizes, shapes, tempers, and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, and special wire. Also, Coated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

NEW PRODUCTS and equipment

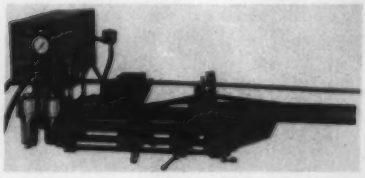


12 in. in diameter; the 3-hp 3GAR has 2½-in. wheels with 14-in. diameters. Adjustable safety guards protect the grinding wheels. *Write*: Standard Electrical Tool Co., 2504 River Rd., Cincinnati 4, O. *Phone*: Grandview 1-6200

Press Feed

The improved Micro-Air power press feed has carriage speeds up to 1½-fps at 100 psi.

Spring loaded grease cups on long bushings give smooth per-



formance. The feed length can be adjusted while the machine is in operation. *Write*: Nadel Tool & Mfg. Co. Inc., 20 Warren St., New York 7, N. Y. *Phone*: Cortlandt 7-8236

Strapping Sealers

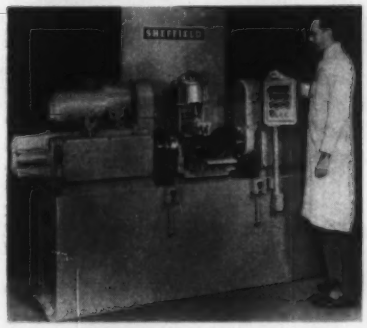
The 7SC 114 single-crimp safety sealer (see photo) has a locking device which forces the operator to complete the sealing stroke before the tool can be removed. It is recommended for heavy-duty applications, such as steel mills and warehouses.

The 7DC 114 sealer (not shown) is designed for heavy-duty ap-

plications that require a double-crimp at one stroke. It is recommended for wide sheet stock or similar items. *Write*: Brainard Steel Division, Sharon Steel Corp., Griswold street, Warren O. *Phone*: 2154-1

Valve Machine

This double-end machine bores, chamfers, faces and threads both ends of a gate valve body in 1 minute. It handles valve bodies from 2 to 6-in. pipe size.



Two model 300 Precision-Pak threading and boring units and an air-operated work positioner and clamping device make up the unit. Model 300 Precision-Pak is an automatic threading unit having a precision lead screw and hydraulic feed for boring and facing. *Write*: Sheffield Corp., Dayton 1, O. *Phone*: Kenmore 3131

Vapor Degreaser

A new unit combines vapor degreasing and a cool dip rinse to wash off chips and other insolubles in one automatic operation.

The liquid solvent rinse reaches blind holes and recesses in the work. The work is cooled, so that in each complete cycle of baskets or tumblers there are two separate condensing vapor stages. The result is a complete degreasing cycle which may be repeated to remove stubborn soil.

Straight work baskets are used

When you buy Acme-Gridley you get SERVICE ANYTIME, ANYWHERE

When a breakdown stops production, downtime becomes an *expensive* liability. Any delay in getting replacement parts or technical help adds to this expense.

With Acme-Gridley bar or chucking automatics in your plant, parts and service help are as close as your telephone—ready to eliminate costly production delays.

National Acme

The NAMCO nameplate on your machine assures service — in emergency or normal situations — when and where you need it.

THE NATIONAL ACME COMPANY • 189 East 131st Street, Cleveland 8, Ohio

New PLAN-GEAR PGT TRANSMISSION

• PATENT PENDING •

the Transmission that's as simple to operate as an Electric Motor

• AMERICAN GEAR'S new **PGT** is a hydraulically operated, compound planetary transmission that provides a simple, versatile and extremely flexible means of power transmission.

• **PGT's** outstanding performance has been verified by complete tests in the laboratories of one of the country's leading Institutes of Technology.* It has been successfully used on earth movers, tractors, road rollers and similar equipment. Sturdily built, conservatively rated, **PGT** offers important advantages over more complex transmissions, including:

- Easily operated by anyone by merely moving a single hydraulic control lever
- Practically instantaneous (1.5 seconds) change of speed or direction without shifting gears
- Only one control valve lever for all speeds and neutral
- Utterly smooth...no shock...no jerk... no noise
- Cushion shift prevents shock loading, eliminates trouble
- Eliminates operator fatigue by eliminating clutch pedal
- Hydraulic control lever placed convenient to operator without regard to location of transmission
- Planetary gearing means considerably less length for comparable loads and speeds
- Positive pressure-fed lubrication to bearings and gears
- Two power take-off apertures can transmit up to one-third of engine output maximum

*Complete report on request

Write today ***for this new 8-page booklet which gives complete information, design details on all 7 models of PGT transmissions***

• 7 DIFFERENT MODELS • 85 OR 150 TO 200 LB. FT. TORQUE
1 OR 2 SPEEDS FORWARD • CHOICE OF REVERSE RATIOS

USE PGT TRANSMISSION ON

• Lift trucks • Earth movers • Hoists and cranes • Car pullers • Slushers
Conveyors • Power take-offs • Front end loaders • Road rollers
Other industrial equipment • Truck mixers

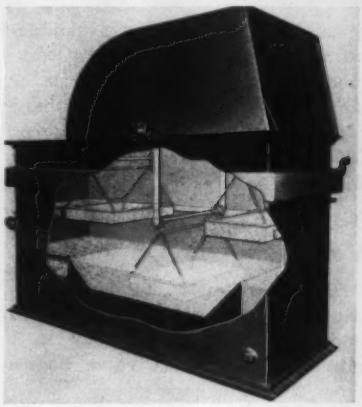
Designed and built exclusively by

AMERICAN GEAR & MFG. CO.

New Avenue, Lemont, Illinois • Phone: Lemont 920

Subsidiary of BRAD FOOTE GEAR WORKS, INC., Cicero 50, Illinois

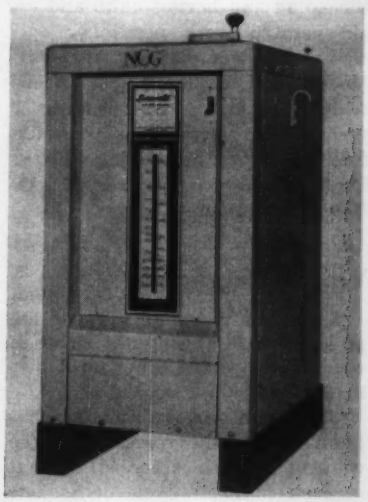
where work is relatively free of recesses or where there is little tendency to nest. Otherwise, tumblers can be used to provide thorough cleaning action. Time cycles



are adjustable for close control of cleaning, both for production requirements and economy of solvent. *Write:* Phillips Mfg. Co., 3443 W. Touhy Ave., Chicago 45, Ill. *Phone:* Ambassador 2-6020

Arc Welder Line

The expanded and improved Sureweld line includes 10 types and 98 models of AC welders, DC rectifier welders, AC inert arc welders, combination AC-DC welders and portable engine-driven DC welders.



The DC rectifier group has been expanded to include four types:

How to Keep Your Production in GOOD SHAPE

Whether you are forming angles, rails or beams, bars or rounds, or any other shapes, National can supply the rolls that will stand up in your stands for longer tonnage life . . . rolls that are soundly cast and precision machined with accurately cut roll passes. To keep your production down time to a minimum, specify durable National rolls; they will more than meet your expectations.

THE NATIONAL ROLL & FOUNDRY CO.

A Wholly-owned subsidiary of General Steel Castings Corporation

Avonmore, (Westmoreland County) Pennsylvania

Specialists in Iron, Alloy Iron and Steel Rolls, Carbon, Alloy and Manganese Steel Castings

ALUMINUM FINISHES

THE FINISHING TOUCH

by A. B. HOEFER
vice president
FREDERIC B. STEVENS, INC.

Will Anodized Aluminum Replace Nickel-Chrome Finishes?

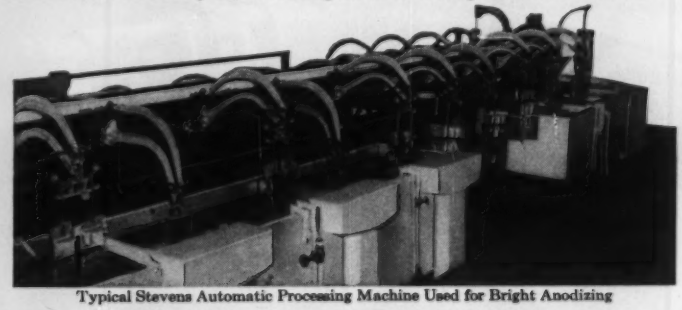
Affirmative answers to this question are revealed in several current business publications and our own sales figures.

Speeding the change is the continued tight supply of nickel. Manufacturers have been forced to look for substitutes for nickel and like the results anodized aluminum have given them.

A trend is developing. Volume of Stevens Automatic anodizing equipment sold in 1955 was nearly double the volume for the two preceding years. At the same time, sales of Stevens compositions used in buffing and polishing aluminum were showing a 50% increase.

Frederic B. Stevens, Inc., manufacture equipment for both nickel-chrome and aluminum finishes. We believe both types of finishes will increase in demand but at the moment the interest in aluminum is high.

If you are considering aluminum for your product, you can be assured that aluminum parts can be bright anodized and finished to compare favorably with the fine finish of chrome plate. In addition, aluminum can be dyed, resulting in non-fading colored finishes.



Typical Stevens Automatic Processing Machine Used for Bright Anodizing

Stevens aluminum anodizing equipment is presently being used and recommended in the finishing of colored anodized tumblers, utensils, refrigerator components, rivets, automotive trim, lighting reflectors, etc.

Stevens' experience in furnishing complete anodizing equipment installations assures you of the latest techniques—the finest finishes—at the lowest costs.

For long range planning consider the versatility of Stevens Automatic equipment. Changes of cycles or processes can be accomplished quickly and inexpensively. Your Stevens Automatic Processing Machine for anodizing can be changed to a nickel-chrome cycle at a later date.

If your design engineers are talking of aluminum to add sales appeal excitement, cost reducing features to your new product lines, let us discuss your requirements with you.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

METAL FINISHING EQUIPMENT AND SUPPLIES FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

BRANCHES:
Buffalo • Cleveland • Indianapolis • New Haven

NEW PRODUCTS and equipment

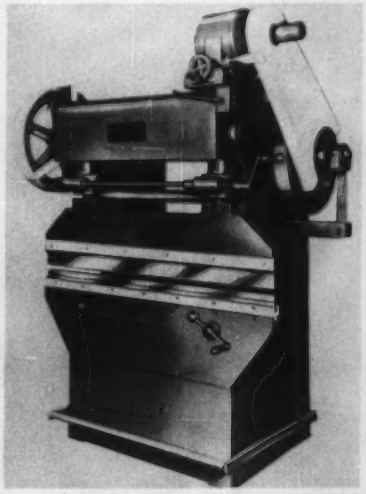
The DRCV series "constant voltage" welder, for inert-gas, metal-arc welding; the DRGA series, designed for maximum crater elimination; the DRH series, a welder featuring new horizontal styling and a convenient single current range; and the standard general-purpose DC rectifier welder.

The SGW, portable, air-cooled, engine-driven unit is rated at 200 amp, 30 v, dc (50-per-cent duty cycle) and will handle electrodes 3/16-in. in diameter. It has a 1500-w, ac power take-off for operating electric power tools, auxiliary lighting, etc.

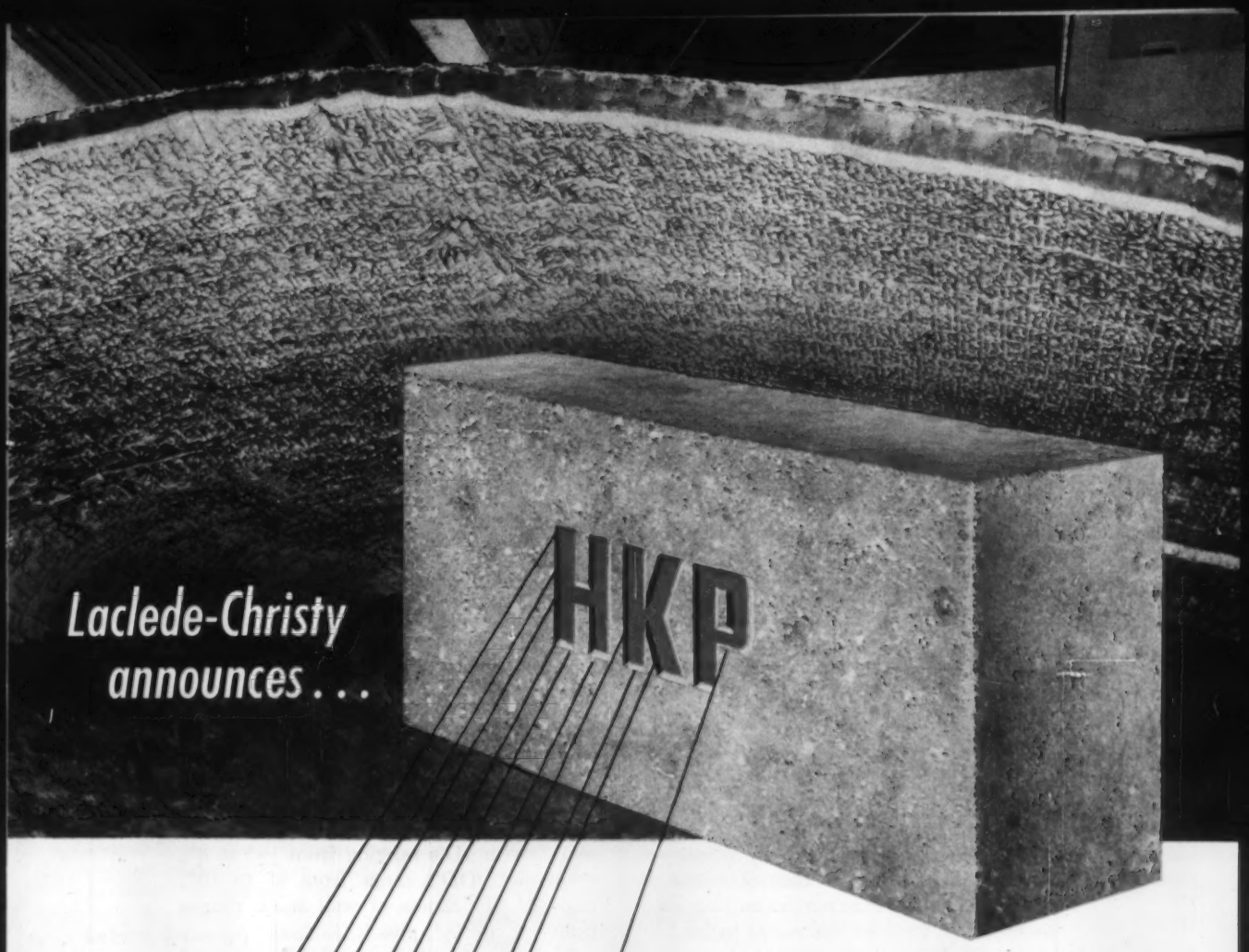
In the inert arc welder group are three new machines: The ACGA-220 series, with mechanical current control; the ACGA-250 series, with electrical current control; and the GAMA series, with electrical control and equipped for alternating and direct current metal arc welding. *Write:* National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill. *Phone:* Whitehall 4-3100

Press Brake

Model 24-A-412 will bend 4 ft of 12-gage mild steel over a 7/8-in. die. A variable speed drive and back gage are operated from the front. The unit has steel gears and a 1-hp motor.



The stroke is 2 in.; ram adjustment is 1½-in. The gap is 6 in. deep. *Write:* W. Whitney Stueck Inc., Old Saybrook, Conn.



Laclede-Christy announces . . .

a new super-duty SILICA BRICK

HKP

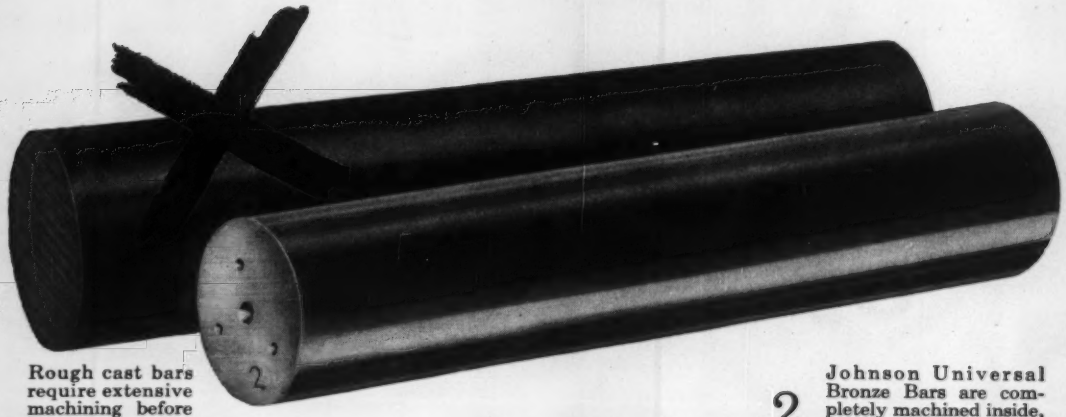
New Laclede HKP Silica Brick has just set roof life records in Open Hearth furnaces of 224 heats and 225 heats in two recent campaigns—both all-time records. *Annual roof life records* show that HKP Silica Brick exceeds other super-duty silica brick by as much as 17% on 250 ton and 285 ton furnaces!

Can you afford to overlook this kind of service and savings? Call your Laclede-Christy representative for prompt action.

LACLEDE-CHRISTY DIVISION

H. K. PORTER COMPANY, INC.

St. Louis 10, Missouri



1. Rough cast bars require extensive machining before reaching usable bronze.

2. Johnson Universal Bronze Bars are completely machined inside, outside and on the ends. There's no waste.

Why pay for bronze you can't use?

That's exactly what happens when you buy rough cast bronze bars of uncertain chemical analysis that require cutting away as much as 25% of the metal inside and outside before you reach usable bronze.

Johnson *guaranteed quality* Universal Bronze Bars in over 400 standard sizes made of Johnson alloy No. 72 are *completely machined*, save you time and money because they are ready to finish into bearings, washers, thrust plates, gears, pinions, guides, rollers, sheaves, trolley wheels and other parts for your original equipment and maintenance.

Cored bars are available from stock in 354 size combinations in standard lengths of 13″ with ID's ranging from ½″ to 8″, minus 1/32″. OD's range from 1″ to 10″, plus 1/32″. Thickness of wall stock ranges from ¼″ to 2½″, plus 1/32″.

The size of each bar is plainly stamped on *both ends* for your convenience. This eliminates needless handling and measuring to find the size you want.

Centering holes (see illustration) are punched on ends of each Johnson bar to save costly set-up time.

Solid (36 sizes) and hexagonal (20 sizes) bars are also available from stock.

Ask your distributor or write for catalog to Johnson Bronze Co., 550 S. Mill St., New Castle, Pa.

Johnson Bronze Company

GRAPHITED
over 175 sizes

GENERAL PURPOSE
over 900 sizes

UNIVERSAL BRONZE BARS
over 400 sizes

LEDALOYL
over 400 sizes

ELECTRIC MOTOR
over 350 sizes

NEW literature

Write directly to the company for a copy

Gear Deburrers

The complete line of Burr-Master machines for deburring and chamfering internal and external gears and splines is described in bulletin BM-1, 12 pages. Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, Mich.

Casters, Truck Lock

A 24-page catalog details this company's line of roller-bearing casters, equipped with micarta, rubber or steel treads and the automatic vehicle position lock—catalog MC-55. Modern Caster Co., Rockford, Ill.

Fork Trucks

Certified Job Study 158, 4 pages, describes the advantages of fork trucks in moving pallets and drums in an automotive plant. Towmotor Corp., 1226 E. 152nd St., Cleveland 10, O.

Fume Control

Case histories treat dust and fume control in the metal refining industry. Wheelabrator Corp., 1157 S. Byrkit St., Mishawaka, Ind.

Rotary Swaging Machines

A new line of machines offers greater capacity in each size range, improved noise control and provisions for a variety of attachments—4 pages. Swaging Machine Division, Torrington Co., North street, Torrington, Conn.

Tandem Transistors

A technical bulletin describes the fundamental circuitry, applications, rating, cutoff frequency, maximum ratings and tandem parameters of these new semiconductors—4 pages. Marvelco Electronics Division, National Aircraft Corp., 3411 Tulare Ave., Burbank, Calif.

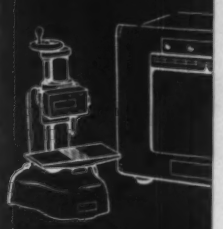
Pneumatic Vibrators

Operating under 20 to 125 psi pressure, pneumatic vibrators assure bulk material flow in bins and hoppers, chutes and railroad hopper cars in the basic processing industries—catalog 101, 4 pages. National Air Vibrator Co., 2372 W. 7th St., Cleveland 13, O.

Machining Stainless Tubing

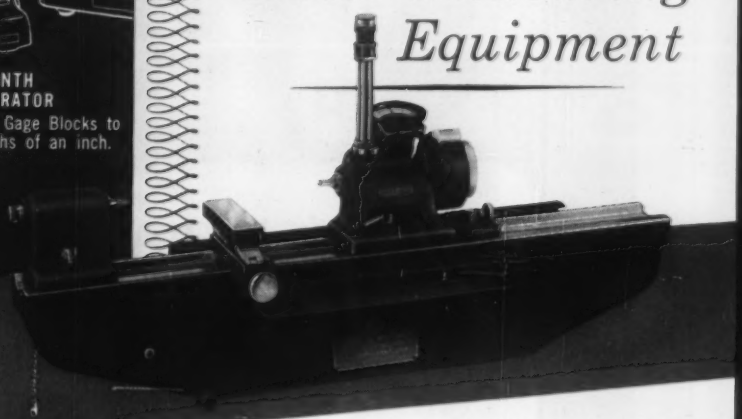
Tooling, cutting oils, finishing operations and power requirements for drilling, threading, reaming, milling

PRECISION GAGE BLOCKS
Basic master standards of measurement, accurate to millionths.



MILLIONTH COMPARATOR
Checks Gage Blocks to millionths of an inch.

To
Insure Quality
INSURE PRECISION
Use
PRATT & WHITNEY
Basic Measuring Equipment



STANDARD MEASURING MACHINE

ELECTROLIMIT UNIVERSAL INTERNAL COMPARATOR
Reads direct to .00002"

SUPERMICROMETER
Reads direct to .0001"

You'll have the best Quality-Insurance obtainable if you make it a policy to determine the *correct* degree of precision for *your* products and then maintain these limits . . . broad or close . . . dependably and accurately, year after year. And the *best* way to provide your plant with this *Basic Accuracy Protection* is by using Pratt & Whitney Basic Measuring Equipment as a constant check on the accuracy of your *working* gages.

The heart of Pratt & Whitney Quality Protection is the Standard Measuring Machine shown here. Reading direct to .00001", it's a basic unit for any Standards Room. Used with the other equipment shown, you'll underwrite Quality, insure Precision and receive lasting dividends.

Write, outlining your Quality Control requirements, for complete recommendations on Pratt & Whitney Basic Measuring Equipment to meet your needs.

PRATT & WHITNEY COMPANY
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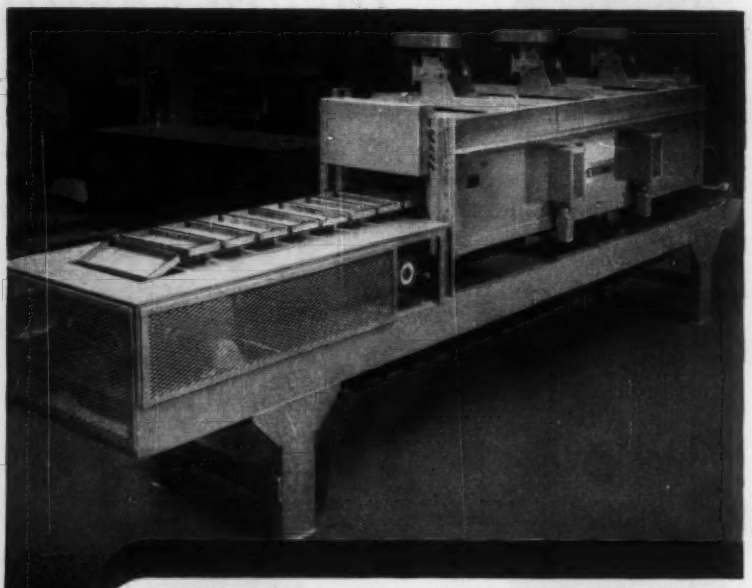
13 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities
MACHINE TOOLS • GAGES • CUTTING TOOLS



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for Continuous Production

HEVI DUTY®

CONVEYOR FURNACE

Of special design for Kohler Co. of Kohler, Wisconsin, this Hevi Duty Conveyor Furnace is being used to heat aluminum and brass billets prior to forging jet engine and other parts. Not only has this furnace been designed for a specific job, but Hevi Duty Engineers also built into this furnace many additional features.

- Notice the three fans which speed the heating of the billets by circulating the heated air, and also assure a uniform temperature in the heating chamber. With this feature, a smaller, more economical furnace is able to do this production job.
- Heat resistant alloy conveyor links and trays mean years of dependable service.
- Versatility . . . by using a variable speed drive to adjust the conveyor speed, this furnace can be used for annealing, tempering, and other heating operations.

Special Hevi Duty Furnaces can be engineered to your specifications and your production system. Let us know your requirements. Our engineers will work with you.

HEVI DUTY ELECTRIC COMPANY
MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces... Electric Exclusively
Dry Type Transformers *Constant Current Regulators*

NEW LITERATURE

and sawing stainless tubing and pipe are discussed in bulletin TDC-182, 4 pages. Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa.

Overhead Traveling Cranes

A 6-page folder tells of the efficiencies made possible by using overhead cranes in receiving, storing and manufacturing heavy-gage automotive frames at a midwest fabricating plant—bulletin 88. Whiting Corp., Harvey, Ill.

Axial Fans

Design and construction features of the Series 203 axial fans for ventilation, process air supply and recirculation applications are described in bulletin B1013, 36 pages. American Blower Corp., Detroit 32, Mich.

Manual Conveyor Systems

Catalog 453 (20 pages) gives complete engineering data on hand pushed trolleys, traveling bridge cranes for trolley conveyors and stub switches. Department NLP, Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich.

Low Temperature Welding

"A Picture Book of Facts on Eutectic Welding Processes" (TIS 2367) describes the "Low Heat Input" process which combines the advantages of the low application heats of brazing and the greater strength of fusion welding—16 pages. Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing 58, N. Y.

Hand Feed Threaders

The reciprocating type machine uses conventional flat dies and will roll greater lengths of threads than can be done commercially on automatic thread rollers—circular 931-A-2, 12 pages. Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

Industrial Insulations

A 20-page catalog gives composition, physical and thermal properties of materials for controlling temperatures from —400 to 3000°F. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

Fastener Engineering Data

A 24-page reference booklet lists fastener design, torque, thread data, gaging, thread tolerances and other topics of interest to fastener users. National Machine Products Co., 44225 Utica Rd., Utica, Mich.

Lamson

1035 CAP SCREWS OFFER GREATER STRENGTH AT...

Less Cost!

If you are now using Full Finished Screws in your assembly operations it will pay you to consider substituting Lamson 1035 Double Heat Treated Cap Screws.

The extra relative toughness of Lamson 1035's enables you to use screws of smaller diameter, yet with equal, or greater, tensile strength.

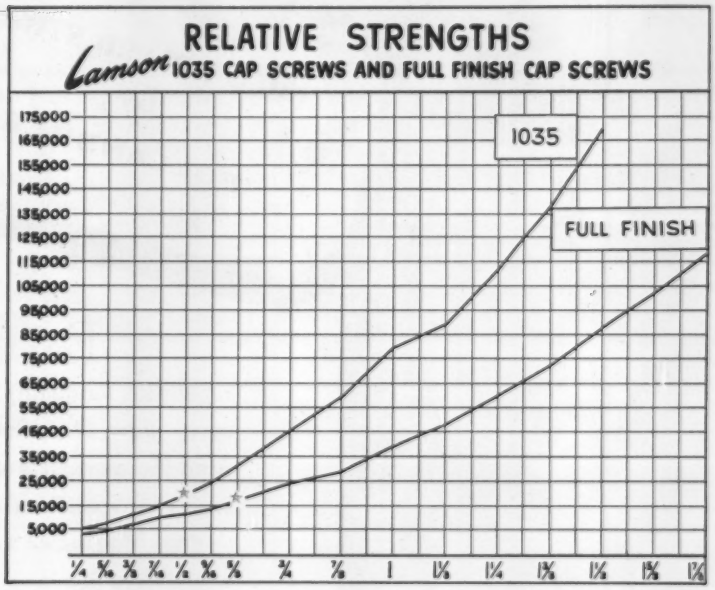
As an example of increased strength at less cost—on the chart below you will see that a ½"* diameter Lamson 1035 Cap Screw has greater tensile strength than a ⅝"* diameter Full Finished Cap Screw. This means savings in weight and size of assembly.

As for money savings—Lamson ½" x 2" 1035 Cap Screws are net priced at $5.36 per hundred as compared to $7.59 per hundred for the ⅝" x 2" Full Finished Screw. Proportionate savings can be made all along the line.

Lamson 1035 Double Heat Treated High Tensile Cap Screws have long been favorites where extra strength and durability is required.

To attain this extra strength, Lamson Cap Screws are first heat treated at about 1600°F. and then quenched. This imparts "hardness". Then the screws are "drawn", or re-heated, to between 900°F. and 1100°F. and then quenched in a special oil.

This results in a minimum tensile strength of 150,000 pounds per square inch.



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Lamson & Sessions

The LAMSON & SESSIONS Co.

1971 West 85TH St. • Cleveland 2, Ohio

CLEVELAND AND KENT, OHIO • BIRMINGHAM • CHICAGO

FOLLANSBEE has been able to maintain its reputation for quality strip steel only by strict control through every phase of production. The steel for your order is yours from the moment Follansbee mill operators begin to fashion it to your specifications.

Your Follansbee representative, knowing that the plant will always deliver a quality order, concentrates on being of service to you. Why not get in touch with him before you place your next order for strip steel.

FOLLANSBEE

STEEL CORPORATION

FOLLANSBEE, WEST VIRGINIA

Cold Rolled Strip • Terne Roll Roofing • Polished Blue Sheets and Coils

Sales Offices in Principal Cities

Market Outlook

MILLS will have orders for all the steel they can produce in the last half of this year.

Emphasis will have to be more on production than on sales.

Three production handicaps will confront the steel industry: The possibility of a midsummer strike by steelworkers, disruptions due to hot weather and vacations, and the necessity to repair equipment which is being pushed to the limit of capacity.

NEED FOR STEEL—While production will be facing hurdles, demand will be strong. The automobile industry—largest consumer of steel—will be in the market for steel for its 1957 models—auto makers are counting on them for a sales spurt. The construction industry—second largest user—received record-breaking orders in March for future work.

MORE CUSTOMERS— There are more people, too, to use products made of steel. In the last 12 months, the U. S. population rose 2.8 million.

Some steel users have been adding to their steel inventories, but stocks are not considered excessive. C. M. White, president, Republic Steel Corp., Cleveland, says: "There has been some inventory accumulation, principally on the part of the automotive industry, where production has been reduced, but in most industries, product output has kept pace with steel receipts. For 1956 as a whole, we look forward to steel production which will be slightly in excess of the record output of 1955."

CONCURRENCE—Avery C. Adams, president, Pittsburgh Steel Co., Pittsburgh, concurs in the belief that this year will be a good one. He points out that an earlier forecast of capacity operations by his company for the entire year is reconfirmed and supported by a substantial increase in unshipped orders.

The booming construction industry is calling for more structural steel shapes and more plates than can be produced. One of the many instances of the heavy demand for the product of the structural mills is this: With arrival of the spring building season, homebuilders in the Cincinnati area are flocking to warehouses for 8-in. beams, a size in critically short supply. Result: A switch to 7 and 10-in. sizes.

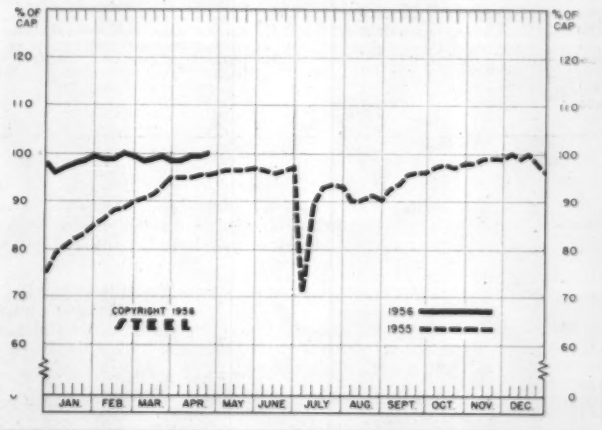
WHEEL SHORTAGE—Railroad freight car builders, whose order books are bulging, have a problem in addition to procurement of steel plates. They're having difficulty getting wheels. Five steel companies have wheel producing facilities, but they have been unable to step up the supply of semifinished steel sufficiently to keep pace with wheel demand.

EASIER— Some of the pressure for hot-rolled bars is melting as a result of a reduction in agricultural implement output. Inventories of implements are good, and retail demand is soft.

Galvanized steel sheets, which were in short supply a year ago, are fairly easy to get, but a pickup in demand may come from the government grain bin program.

AT CAPACITY— Despite the few soft spots in steel demand, over-all requirements are sufficient to keep mills producing at capacity. In the week ended Apr. 22, mills produced steel for ingots and castings at 100 per cent of capacity. The preceding week's rate was 99.5.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended Apr. 22	Change	Same Week 1955	Same Week 1954
Pittsburgh	101.5	— 1.5*	98.5	72
Chicago	100.5	— 2.5*	99	79.5
Mid-Atlantic	100	+ 1	96	57
Youngstown	97	— 3	96	67
Wheeling	98.5	0	94	84
Cleveland	95.5	0	97.5	75
Buffalo	105	0	104.5	67.5
Birmingham	93	0	90	53.5
New England	86	+ 1	84	60
Cincinnati	95	+ 1.5	91	61.5
St. Louis	95	— 4.5	106	55.5
Detroit	97	+ 1.5*	91	60.5
Western	105	+ 1	96	81
National Rate	100	+ 0.5	95.5	69

INGOT PRODUCTION‡

	Week Ended Apr. 22	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	152.3†	154.6	152.5	142.2
NET TONS (In thousands)	2,447†	2,483	2,449	2,284

*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. Weeky capacity (net tons): 2,461,893 in 1956; 2,413,278 in 1955; 2,384,549 in 1954.

Metalworking Outlook—p. 59

Technical Outlook—p. 115

Price Indexes and Composites

FINISHED STEEL PRICE INDEX (Bureau of Labor Statistics)

	Apr. 17 1956	Apr. 10 1956	Month Ago	Mar. Average
(1947-1949=100)	157.1	157.1	157.1	157.1

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Apr. 17

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard, No. 1	$4.800	Sheets, Electrical	$10.175
Rails, Light, 40 lb	6.217	Strip, C.R., Carbon	8.243
Tie Plates	5.625	Strip, C.R., Stainless, 403 (lb)	0.444
Axles, Railway	8.350	Strip, H.R., Carbon	5.606
Wheels, Freight Car, 33 in. (per wheel)	52.50	Pipe, Black, Buttweld (100 ft)	16.997
Plates, Carbon	5.209	Pipe, Galv., Buttweld (100 ft)	21.137
Structural Shapes	4.867	Pipe, Line (100 ft)	167.250
Bars, Tool Steel, Carbon (lb)	0.460	Casing, Oil Well, Carbon (100 ft)	165.120
Bars, Tool Steel Alloy, Oil Hardening Die (lb)	0.560	Casing, Oil Well, Alloy (100 ft)	244.670
Bars, Tool Steel, H. R., Alloy, High Speed W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.185	Tubes, Boiler (100 ft)	39.470
Bars, Tool Steel, H.R., Alloy, High Speed W-18, Cr 4, V 1 (lb)	1.680	Tubing, Mechanical, Carbon	21.133
Bars, H.R., Alloy	9.425	Tubing, Mechanical Stainless, 304 (100 ft)	178.897
Bars, H.R., Stainless, 303 (lb)	0.450	Tin plate, Hot-dipped, 1.25 lb	8.933
Bars, H.R., Carbon	5.500	Tin Plate, Electrolytic, 0.25 lb	7.633
Bars, Reinforcing	5.313	Black Plate, Canmaking Quality	6.733
Bars, C.F., Carbon	8.800	Wire, Drawn, Carbon	8.575
Bars, C.F., Alloy	12.275	Wire, Drawn, Stainless 430 (lb)	0.590
Bars, C.F., Stainless, 302 (lb)	0.475	Bale ties (bundle)	6.537
Sheets, H.R., Carbon	5.345	Nails, Wire, 8d Common	8.693
Sheets, C.R., Carbon	6.214	Wire, Barbed (80-rod spool)	7.847
Sheets, Galvanized	7.770	Woven Wire Fence (20-rod roll)	18.635
Sheets, C.R., Stainless 302 (lb)	0.588		

STEEL's FINISHED STEEL PRICE INDEX*

	Apr. 18 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Index (1935-39 av.=100)	209.10	209.10	209.10	194.53	171.92
Index in cents per lb	5.665	5.665	5.665	5.270	4.657

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT*	$128.02	$128.02	$128.02	$118.45	$106.32
No. 2 Fdry Pig Iron, GT	60.06	60.06	58.99	56.54	52.54
Basic Pig Iron, GT	59.61	59.61	58.49	56.04	52.16
Malleable Pig Iron, GT	61.06	61.06	59.77	57.27	53.27
Steelmaking Scrap, GT	55.00	55.00	49.83	36.08	44.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	Apr. 18 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bars, H.R., Pittsburgh	4.65	4.65	4.65	4.30	3.70
Bars, H.R., Chicago	4.65	4.65	4.65	4.30	3.70
Bars, H.R., deld. Philadelphia	4.93	4.93	4.93	4.55	4.20
Bars, C.F., Pittsburgh	6.25*	6.25*	6.25*	5.40	4.55
Shapes, Std., Pittsburgh	4.60	4.60	4.60	4.25	3.65
Shapes, Std., Chicago	4.60	4.60	4.60	4.25	3.65
Shapes, deld., Philadelphia	5.00	5.00	5.00	4.53	3.91
Plates, Pittsburgh	4.50	4.50	4.50	4.225	3.70
Plates, Chicago	4.50	4.50	4.50	4.225	3.70
Plates, Coatesville, Pa.	4.80	4.80	4.80	4.225	4.15
Plates, Sparrows Point, Md.	4.50	4.50	4.50	4.225	3.70
Plates, Claymont, Del.	4.80	4.80	4.80	4.225	4.15
Sheets, H.R., Pittsburgh	4.325	4.325	4.325	4.05	3.60-3.75
Sheets, H.R., Chicago	4.325	4.325	4.325	4.05	3.60
Sheets, C.R., Pittsburgh	5.325	5.325	5.325	4.95	4.35
Sheets, C.R., Chicago	5.325	5.325	5.325	4.95	4.35
Sheets, C.R., Detroit	5.325-5.425	5.325-5.425	5.325-5.425	5.10	4.55
Sheets, Galv., Pittsburgh	5.85	5.85	5.85	5.45	4.80
Strip, H.R., Pittsburgh	4.325	4.325	4.325	4.05	3.75-4.00
Strip, H.R., Chicago	4.325	4.325	4.325	4.05	3.50
Strip, C.R., Pittsburgh	6.25	6.25	6.25	5.75	4.65-5.35
Strip, C.R., Chicago	6.25-6.35	6.25-6.35	6.25-6.35	5.85	4.90
Strip, C.R., Detroit	6.35	6.35	6.35	5.90	4.35-5.60
Wire, Basic, Pittsburgh	6.60	6.60	6.60	5.75	4.85-5.10
Nails, Wire, Pittsburgh	7.60	7.60	7.60	6.85	5.90-6.20
Tin plate (1.50 lb), box, Pitts.	$9.45	$9.45	$9.45	$9.05	$8.70

*Including 0.35c for special quality

SEMIFINISHED STEEL					
Billets, Forging, Pitts. (NT)	$84.50	$84.50	$84.50	$78.00	$66.00
Wire rods, ⅓-⅝" Pitts.	5.375	5.375	5.375	4.675	4.10-4.30
PIG IRON, Gross Ton					
Bessemer, Pitts.	$61.00	$61.00	$59.50	$57.00	$53.00
Basic Valley	60.00	60.00	58.50	56.00	52.00
Basic, deld. Phila.	63.76	63.76	62.16	59.66	56.49
No. 2 Fdry, Pitts.	60.50	60.50	59.00	56.50	52.50
No. 2 Fdry, Chicago	60.50	60.50	59.00	56.50	52.50
No. 2 Fdry, deld. Phila.	64.26	64.26	62.66	55.16	56.99
No. 2 Fdry, Birm.	55.00	55.00	55.00	52.88	48.88
No. 2 Fdry (Birm.) deld. Cin.	62.70	62.70	62.70	60.58	55.33
Malleable, Valley	60.50	60.50	59.00	56.50	52.50
Malleable, Chicago	60.50	60.50	59.00	56.50	52.50
Ferromanganese, Duquesne	215.00†	215.00†	205.00†	190.00†	188.00*

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pitts.	$54.50	$54.50	$49.00	$35.50	$45.00
No. 1 Heavy Melt, E. Pa.	56.00	56.00	51.00	37.75	43.50
No. 1 Heavy Melt, Chicago	54.50	54.50	49.50	35.00	43.50
No. 1 Heavy Melt, Valley	60.50	58.50	55.50	35.50	45.00
No. 1 Heavy Melt, Cleve.	57.50	57.50	52.50	33.50	44.00
No. 1 Heavy Melt, Buffalo	55.50	55.50	47.50	32.50	44.00
Rails, Rerolling, Chicago	72.50	72.50	66.50	52.50	52.50
No. 1 Cast, Chicago	51.50	51.50	48.50	41.50	49.00
COKE, Net Ton					
Beehive, Furn. Connlsvl.	$14.125	$14.125	$14.125	$13.75	$14.75
Beehive, Fdry. Connlsvl.	16.50	16.50	16.50	16.75	17.50
Oven, Fdry, Chicago	27.00	27.00	27.00	24.50	21.00

Daily Nonferrous Price Record

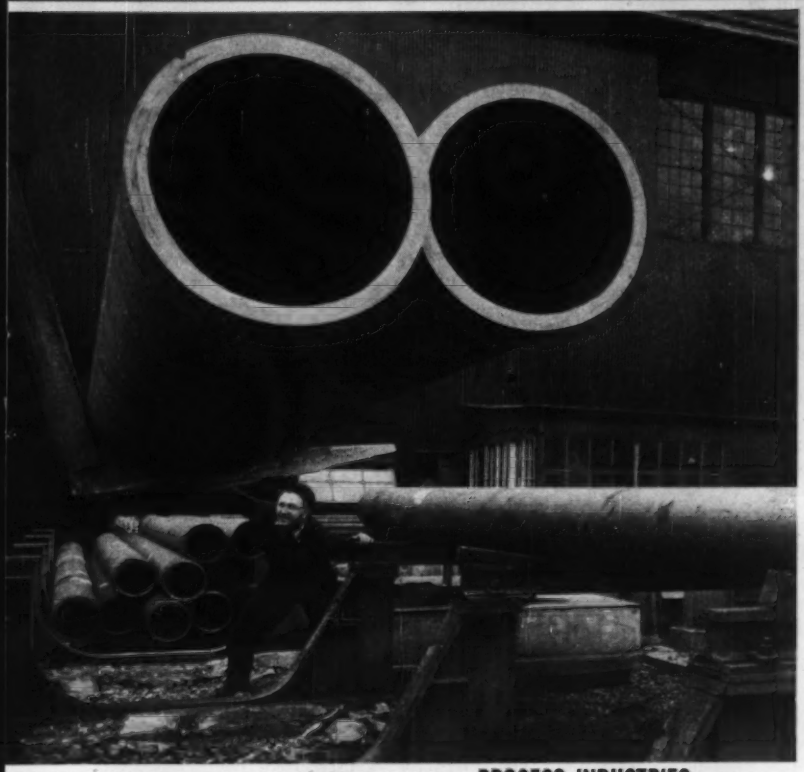
	Price Apr. 18	Last Change	Previous Price	Mar. Avg.	Feb. Avg.	Apr. 1955 Avg.
Copper	46.00-49.00	Apr. 18, 1956	46.00-49.50	49.727	48.076	36.000
Lead	15.80	Jan. 13, 1956	16.30	15.800	15.800	14.800
Zinc	13.50	Jan. 6, 1956	13.00	13.500	13.500	11.927
Tin	98.785	Apr. 18, 1956	99.25	100.606	100.908	91.458
Nickel	64.50	Nov. 24, 1954	60.00	64.500	64.500	64.500
Aluminum	25.90	Mar. 29, 1956	24.40-25.90	24.650	24.400	23.200
Magnesium	32.50	Aug. 16, 1955	28.50	32.500	32.500	28.500

Quotations in cents per pound based on: COPPER, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingots, 99 + %, deld.; MAGNESIUM, pig, 99.8%, Freeport, Tex.

What You Can Use the Markets Section for:

- **A source of price information.** Current prices are reported each week. Price changes are shown in italics. Price trends are shown in tables of indexes and comparisons.
- **A directory of producing points.** Want to know who makes something, or where it is made? The steel price tables alphabetically list the cities of production and indicate the producing company. If you are a buyer, you may want to make a map showing comparative distances of sources of supply and to help you compute freight costs. If you are a seller of supplies you can make a map to spot your sales possibilities.
- **A source of price data for making your own comparisons.** Maybe you want to keep a continuous record of price spread between various forms of steel. You can get your base price information from STEEL's price tables.
- **A source of information on market trends.** Newsy items tell you about the supply-demand situation of materials, including iron and steel, nonferrous metals and scrap. Other articles analyze special situations of interest and importance to you.
- **Reports on iron and steel production, and materials and product shipments.**

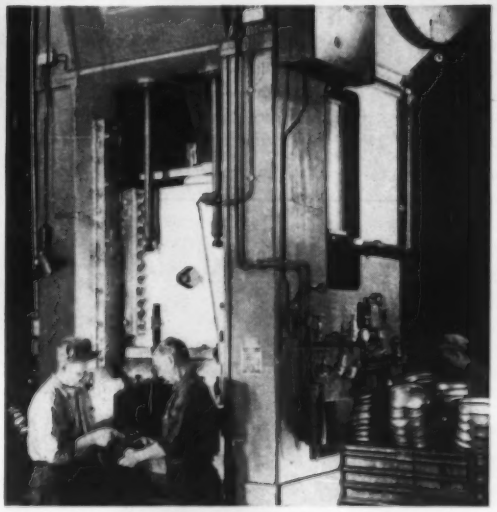
BARIUM STEEL—active in America's growth



MILITARY AVIATION'S most widely used filler cap above is designed for fuel, oil, water and water-alcohol tanks as well as disposable tanks which can be dropped from the aircraft when empty. Barium's East Coast Aeronautics, Inc. produces it in 72 different models and in various sizes for pressures up to 100 psi through a wide temperature range.

PROCESS INDUSTRIES, with their ever-increasing need for steel pipe and high pressure tubing, get special treatment at Phoenix Iron & Steel Company's new seamless tube mill. This latest Barium unit is set up for commercial production of heavy wall pipe (above) over a wide range of special lengths, diameters and wall thicknesses. A good example of Barium's "step-ahead" thinking.

SHIPPING cargoes get fast handling with giant Whirley cranes (single lift capacities to 83 tons) above, and Unloaders (capacities to 1200 tons per hour) from Barium's Clyde Iron Works, Inc. But king-sized materials-handling like this is only one job on which Barium delivers the goods faster. For a complete listing of our products and services see Thomas' Register, Section A to Z.



CONSTRUCTION men come to Barium for specials, too. Here at Erie Bolt and Nut Co. bolts, nuts, studs and machine parts—in quantities as small as a hundred units—are turned out to precise tolerances in a variety of alloy and standard steels. For facts on Barium's part in your industry's growth, write Barium Steel Corporation, 25 Broad Street, New York 4, N. Y.

APPLIANCE MANUFACTURERS are cutting costs and weights of parts by as much as 40% here because Barium's Geometric Stamping Company is able to convert castings to stampings at considerable savings to its customers. This 250-ton straight side press with its 16 square-foot bed area helps Geometric maintain leadership in quality contract stamping.

STEEL PRODUCERS

Phoenix Iron & Steel Co. (Plate Div.; Structural Div.; Steel Tube Div.; Blast Furnace Div.)

STEEL FABRICATORS & PROCESSORS

Phoenix Bridge Company • Industrial Forge & Steel, Inc. • Globe Forge, Inc. • The Geometric Stamping Company

A GROUP OF INTEGRATED COMPANIES

BARIUM

STEEL CORPORATION

MODERN IN STEEL, ALUMINUM, MAGNESIUM, FIBERGLASS

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LIGHTWEIGHT METAL AND PLASTICS

East Coast Aeronautics, Inc.

6.2A

Nonferrous Metals

Barring work stoppages, the copper shortage could be over. Chile may find itself in an economic dilemma of its own making as London Metal Exchange prices fall

Nonferrous Metal Prices, Pages 168 & 169

WORLD production of refined copper reached record proportions in March. Some 258,506 tons were produced, reports the Copper Institute.

Deliveries to fabricators jumped 26,113 tons over the low February totals of 236,841 tons (see table).

At midweek, the London Metal Exchange quotation for the red metal stood at 46.90 cents a pound. If you subtract ocean freight charges, the LME price is under the domestic quotation for primary copper, which stands at 46 cents a pound. Prices of custom smelters have fallen to 49 cents a pound.

Barometers—There are indications that copper prices will continue to fall: 1. Brass and copper mills are beginning to accept orders on a three-to-six-week basis. Less than two months ago deliveries were taking up to 90 days. 2. European demand for copper is skidding. 3. Fabricators are working off inventories and attempting to determine what stock level should be maintained to keep up with orders from customers in the second quarter.

With falling prices, some mills will attempt to order just enough to cover commitments. Others, looking toward June labor negotiations, will keep inventories high, gambling that any work stoppages will send copper prices soaring.

Dilemma—If the trend continues there are going to be some extremely perplexed Chileans. They demanded that the price of Chilean copper be based on the LME quotation when the price was at an all-time London high of some 55 cents a pound. After fighting this through with Anaconda Co. and Kennecott Copper Corp., Chilean financial ministers are looking at quotations which are slightly under parity with domestic prices. American producers in Chile have every right to remark: "You asked for it; now live with it." But they won't. The State department will have much to say about good relations with our South American neighbor.

Aluminum Grows and Grows

Record-breaking primary production reports and expansion announcements are becoming commonplace in the aluminum industry. After breaking domestic production records seven times in 1955, U. S. primary producers turned out 145,938 tons in March, the Aluminum Association reports. This is a 5256-ton increase over December, the previous record month. This year's first quarter total is 419,094 tons, another record. During the first quarter of 1955, production was 374,712 tons.

Aluminum Co. of America continues the spring expansion fever by announcing that it will build a 150,000-ton smelting plant near Evansville, Ind. Cost: About $80 million. First production is scheduled for the fall of 1957, using interim power from Southern Indiana Gas & Electric Co.

The smelter will increase Alcoa's installed primary capacity (existing and planned) to 942,500 tons. Annual rate at the end of December, 1955, was some 700,000 tons.

Tin Market Firm

Tin prices continue to hover near the 99-cent-a-pound mark. The price will be influenced for the next several months by the operating rate of the government's Texas City tin smelter. If the operation begins to taper off, tin prices will certainly slide. But if the smelter continues to turn out tin for U. S. stockpile at its present rate, it will keep supply and demand just about in balance.

Tinmen point out that there is little hope of getting the buffer organization under way (based on the International Tin Agreement) so long as the Texas City smelter keeps its doors open. The buffer manager has to be able to buy tin at a reduced price to get started. This means that he will be handcuffed until there is an oversupply.

Magnesium Prices Jump

Primary magnesium prices were increased 1¼-cents a pound last Monday. The increase, announced by Dow Chemical Co., will bring the price of primary pig to 33.75 cents a pound and primary ingot to 34.50 cents a pound. The significant note is that Dow is dropping the practice of giving a 2-cent-a-pound discount on primary when the buyer indicates that the metal will be used for a magnesium end product. Key: Dow apparently feels that magnesium (as a metal) can stand on its merits from now on.

Lead, Zinc Sales Moderate

Lead and zinc sales continue to be adequate, but far from excellent. Producers of special high grade zinc are beginning to feel that there may be no real spring push on 1956 model cars and that they may have to wait for the introduction of next year's models before special high grade sales show any marked improvement. Other grades are registering satisfactory sales.

Lead sales are picking up a bit, but stocks are still high at the consumer level. Battery manufacturers continue to show signs of coming to life. Outlook: The General Services Administration may get fairly substantial tonnages of zinc this month. Lead producers will depend on battery makers to bolster sales.

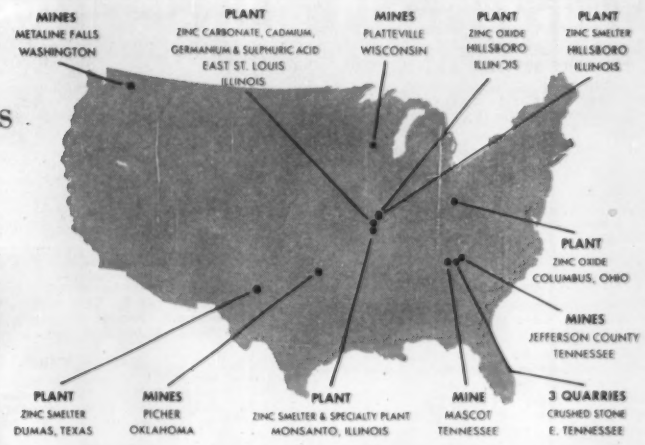
World Copper Output Hits New High

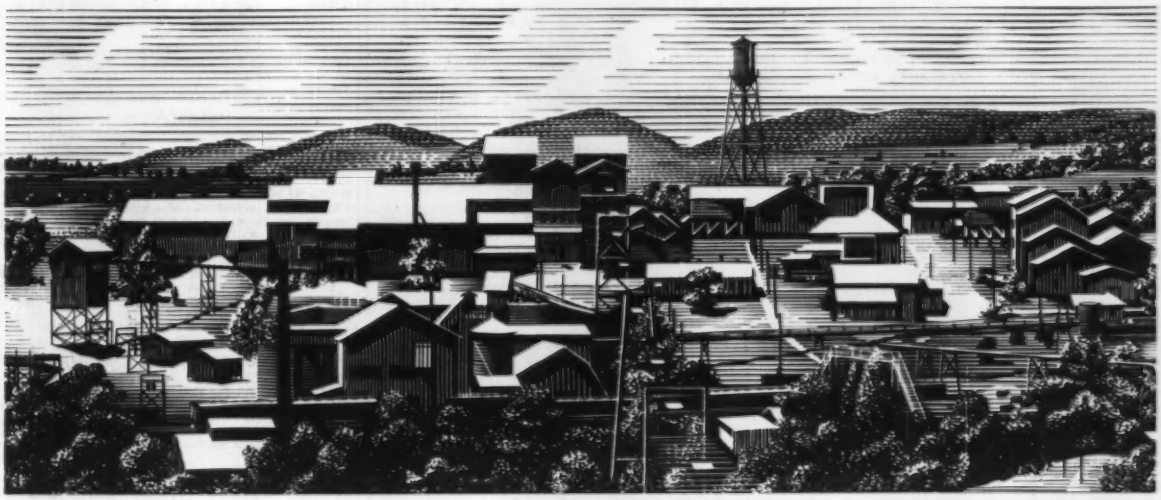
(In Tons)

	—Crude Production— Primary	Secondary	Refined Production	Deliveries To Fabricators
March	244,572	14,292	258,506	262,954
February	229,760	13,505	243,458	236,841
January	233,897	11,250	237,300	242,425
1st Quarter, 1956	708,229	39,047	739,264	742,220

Source: Copper Institute

American Zinc and its products *from* A *to* Z





CONCENTRATING MILL,
MASCOT, TENNESSEE

One of the key factors in American Zinc's widespread mining and milling operations. In Tennessee, American Zinc also owns and operates mines in Jefferson County. It is here that one of the largest known reserves of zinc in the United States is found (in excess of 1,250,000 tons of recoverable zinc, proven, with additional large reserves indicated). Other company-owned and operated mining properties are located at Platteville District, Southern Wisconsin; Metaline Falls District, Eastern Washington; and Picher field of the Tri-State Area (Missouri-Kansas-Oklahoma). For the complete picture, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

Nonferrous Metals

Cents per pound, carlots, except as otherwise noted

PRIMARY METALS AND ALLOYS

Aluminum: 99 + %, ingots, 25.90; pigs, 24.00, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 12% Si, 27.70; No. 43, 5% Si, 27.50; No. 142, 4% Cu, 1.5% Mg, 2% Ni, 29.70; No. 195, 4.5% Cu, 0.8% Si, 29.10; No. 214, 3.8% Mg, 29.30; No. 356, 7% Si, 0.3% Mg, 27.70.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.00-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, f.o.b. Reading, Pa., Elmore, O.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. Reading, Pa., or Elmore, O.

Bismuth: $2.25 per lb ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 97-99%, $2.60 per lb for 550-lb keg; $2.62 per lb for 100-lb case; $2.67 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 46.00 deld. Conn. Valley; 46.00 deld. Midwest; custom smelter, 49.00 deld.; Lake, 46.00 deld.; Fire refined, 45.75 deld.; Chilean electrolytic, 47.36 deld.

Germanium: First reduction, $201.85-$220 per lb; intrinsic grade, $220-$242.67 per lb, depending on quantity.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $100-$110 nom. per troy oz.

Lead: Common, 15.80; chemical, 15.90; corroding, 15.90, St. Louis. New York basis, add 0.20.

Lithium: 99 +, cups or ingots, $11.50; rod $13.50; shot or wire, $14.50, f.o.b. Minneapolis. 100 lb lots.

Magnesium: Pig, 33.75 f.o.b. Velasco, Tex.; ingot, 34.50 f.o.b. Velasco, Tex.

Magnesium Alloys: AZ91B (diecasting), 35.00 deld.; AZ63A, AZ92A, AZ91C (sand casting), 39.25 f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $268-$270 per 76-lb flask.

Molybdenum: Powder, 99% hydrogen reduced, $3.20 per lb; pressed ingot, $4.06 per lb; sintered ingot, $5.53 per lb.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 64.50; 10-lb pigs, unpacked, 67.65; "XX" nickel shot, 69.00; "F" nickel shot or ingots for addition to cast iron, 64.50; prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 0.92.

Osmium: $80-$100 per troy oz nom.

Palladium: $23-$24 per troy oz.

Platinum: $97-$111 per troy oz from refineries.

Radium: $16-$21.50 per mg radium content, depending on quantity.

Rhodium: $118-$125 per troy oz.

Ruthenium: $45-$55 per troy oz.

Selenium: 99.5%, $13.50-$15.50 per lb.

Silver: Open market, 91.00 per troy oz.

Sodium: 16.50, c.l.; 17.00 l.c.l

Tantalum: Sheet, rod, $68.70 per lb; powder, $56.63 per lb.

Tellurium: $1.50-$1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot, 98.875; prompt, 98.75.

Titanium: Sponge, 99.3+%, grade A-1 ductile (0.3% Fe max), $3.45; grade A-2 (0.5% Fe max), $3.15 per pound.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $4.50 per lb, nom, f.o.b. shipping point; less than 1000 lb add 15.00; 99 +% hydrogen reduced, $5.00. Treated ingot, $6.70.

Zinc: Prime Western, 13.50; brass special, 13.75; intermediate, 14.00, East St. Louis, freight allowed over 0.50 per pound. High grade, 14.85; special high grade, 15.25 deld.

Diecasting alloy ingot No. 3, 18.00; No. 2, 19.00; No. 5, 18.50, deld.

Zirconium: Ingots, commercial grade, $14.40 per lb; low-hafnium reactor grade, $23.07. Sponge, commercial grade, $7.50-$10.00 per lb, depending on quantity; reactor grade, $14.00-$22.00 per lb, depending on quantity. Powder, electronics grade, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 28.75-30.25; No. 12 foundry alloy (No. 2 grade), 28.75-29.50; 5% silicon alloy, 0.60 Cu max, 31.00; 13 alloy, 0.60 Cu max, 31.00; 195 alloy, 31.00; 108 alloy, 29.25. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 29.50-30.50; grade 2, 28.50-29.50; grade 3, 27.75-28.75 grade 4, 27.00-28.00.

Brass Ingot: Red brass, No. 115, 42.00; tin bronze, No. 225, 55.75; No. 245, 48.75; high-leaded tin bronze, No. 305, 45.75; No. 1 yellow, No. 405, 33.25; manganese bronze, No. 421, 37.75.

Magnesium Alloy Ingot: AZ63A, 36.00; AZ91B, 36.00; AZ91C, 36.00; AZ92A, 36.00.

NONFERROUS MILL PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb, f.o.b. Temple, Pa.; nominal 1.9% Be alloy) Strip, $1.92; rod, bar, wire, $1.89.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 51.355; l.c.l., 51.98. Weatherproof, 30,000-lb lots, 48.28; l.c.l., 49.03. Magnet wire deld., 15,000 lb or more, 58.68; l.c.l., 59.43.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh) Sheets, full rolls, 140 sq ft or more, $21.50 per cwt; pipe, full coils, $21.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill) Sheets, $13.10-$13.60; sheared mill plate, $10.50-$12.00; strip, $13.10-$13.60; wire, $9.50-$11.50; forging billets, $7.90-$8.15; hot-rolled and forged bars, $7.90-$8.15.

ZINC

(Prices per lb. c.l., f.o.b. mill) Sheets, 24.00; ribbon zinc in coils, 21.50; plates, 20.00.

ZIRCONIUM

Plate, $22; H.R. strip, $19; C.R. strip, $29; forged or H.R. bars, $17; wire, 0.015 in., 1.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	102	83	99
Strip, C.R.	102	92	125
Plate, H.R.	97	87	95
Rod, Shapes, H.R.	87	74	93
Seamless Tubes	122	110	153

ALUMINUM

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
Drawn				
0.125	69.4	67.9	...	...
0.156-0.172	59.0	57.4	...	...
0.188	59.0	57.4	...	73.2
0.219-0.234	56.0	54.4	...	...
0.250-0.281	56.0	54.4	...	69.9
0.313	56.0	54.4	...	66.7
Cold-finished				
0.375-0.547	54.9	52.9	65.2	62.8
0.563-0.688	54.9	52.9	62.1	59.0
0.750-1.000	53.6	51.6	58.9	55.7
1.063	53.6	51.6	...	53.8
1.125-1.500	51.6	49.7	55.1	53.8
Rolled				
1.563	50.3	48.4	...	...
1.625-2.000	49.7	47.7	...	52.0
2.125-2.500	48.5	46.5	...	...
2.563-3.375	47.1	45.1	...	...

ALUMINUM

Sheet and Circle: 1100 and 3003 mill finish (30,000 lb base; freight allowed)

Thickness Range Inches	Flat Sheet	Flat Sheet Circles*	Coiled Sheet	Coiled Sheet Circles†
0.249-0.136	37.5	42.3	...	...
0.135-0.096	38.0	43.2	...	...
0.095-0.077	38.7	44.2	36.1	41.3
0.076-0.061	39.3	45.1	36.3	41.5
0.060-0.048	39.9	45.6	36.7	42.0
0.047-0.038	40.4	46.5	37.2	42.4
0.037-0.030	40.8	47.0	37.6	43.1
0.029-0.024	41.4	47.5	37.9	43.6
0.023-0.019	42.2	49.0	38.8	44.5
0.018-0.017	43.0	...	39.4	45.4
0.016-0.015	43.9	...	40.2	46.6
0.014	44.9	...	41.2	47.9
0.013-0.012	46.1	...	41.9	48.9
0.011	47.1	...	43.1	50.5
0.010-0.0095	48.4	...	44.3	52.2
0.009-0.0085	49.7	...	45.8	54.3
0.008-0.0075	51.3	...	47.0	56.1
0.007	52.8	...	48.5	58.4
0.006	54.4	...	49.9	63.4

*48 in. max diam. †26 in. max diam.

ALUMINUM

Plates and Circles: Thickness 0.250-3 in., 24-60 in. width or diam, 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	36.5	40.8
5050-F	37.6	41.9
3004-F	38.6	43.8
5052-F	39.9	45.2
6061-T6	41.1	46.0
2024-T4*	43.6	49.9
7075-T6*	51.4	58.5

*24-48 in. widths or diam, 72-180 lengths.

ALUMINUM

Forging Stock: Round, Class 1, 40.60-51.60 in specific lengths 36-144 in., diameters 0.375-8 in. Rectangles and squares, Class 1, 44.50-57.70 in random lengths, 0.375-4 in. thick, width 0.750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, 20-ft length, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
¾	$16.85	2	$ 51.95
1	26.50	4	143.00
1¼	35.85	6	256.70
1½	42.90	8	386.30

MAGNESIUM

Sheet and Plate: AZ31A standard grade, .032 in., 99.00; .064 in., 78.00; .125 in., 63.50; .250-2.0 in., 61.00. AZ31A special grade, .032 in., 145.00; .064 in., 100.00; .125 in., 83.00; .250-2.0 in., 79.00. Tread plate, .125 in., 68.00; .250-3.0 in., 64.00. Tooling plate, .250-3.0 in., 65.00.

Extrusions	Com. Grade (FS)	Spec. Grade (AZ31B)
1 in. diam. rod	61.50	73.00
Shapes: 0.3 lb/ft	65.40-72.40	76.90-83.90
1.0 lb/ft	61.90-67.30	73.40-78.80
4.0 lb/ft	57.70-62.20	69.20-73.70
2 in. OD x ⅛ in. w. tubing	74.50	86.00

NONFERROUS SCRAP

DEALERS BUYING PRICES

(Cents per pound, New York, in ton lots)

Aluminum: 1100 clippings, 21.00; old sheets, 18.00; borings and turnings, 11.50-12.50; crankcases, 18.00; industrial castings, 18.00.

Copper and Brass: No. 1 heavy copper and wire, 39.50-40.00; No. 2 heavy copper and wire, 37.50-38.00; light copper, 35.00-35.50; No. 1 composition red brass, 31.50-32.00; No. 1 composition turnings, 30.00-30.50; yellow brass

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnings
Copper	68.63b	65.86c	....	68.82	43.500	43.500	42.750
Yellow Brass	56.60	46.58d	57.14	59.51	32.250	32.000	29.875
Low Brass, 80%	61.35	61.29	61.89	64.16	36.625	36.375	35.875
Red Brass, 85%	63.07	63.01	63.61	65.88	38.250	38.000	37.500
Com. Bronze, 90%	65.33	65.27	65.87	67.89	39.875	39.625	39.125
Manganese Bronze	63.54-63.66	57.52-57.64	67.99	....	30.250	30.000	29.500
Muntz Metal	57.84	53.65	....	....	30.125	29.875	29.375
Naval Brass	59.60-59.80	54.11	66.86	62.96	29.875	29.625	29.125
Silicon Bronze	71.92	71.11	71.96	74.13e	42.250	42.000	41.250
Nickel Silver, 10%	70.17	72.41g	72.41	....	35.625	35.375	17.813
Phos. Bronze, A, 5%	86.79	87.29	87.29	88.47	44.000	43.750	42.750

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. Based on copper at 47.5 cents a pound. g. Leaded

turnings, 19.50-20.50; new brass clippings, 28.00-28.50; light brass, 19.00-19.50; heavy yellow brass, 21.50-22.00; new brass rod ends, 26.50-27.00; auto radiators, unsweated, 24.00-24.50; cocks and faucets, 24.50-25.00; brass pipe, 25.00-25.50.

Lead: Heavy, 12.75-13.00; battery plates, 6.50-6.75; linotype and stereotype, 14.00-14.50; electrotype, 13.25-13.75; mixed babbitt, 15.50.

Magnesium: Clippings, 18.50-19.50; clean castings, 18.00-19.00; iron castings, not over 10% removable Fe, less full deduction for Fe, 16.00-17.00.

Monel: Clippings, 90.00-100.00; old sheets, 85.00-95.00 ; turnings, 80.00-85.00; rods, 95.00-100.00.

Nickel: Sheets and clips, 200.00-225.00; rolled anodes, 200.00-225.00; turnings, 180.00-200.00; rod ends, 200.00-225.00.

Zinc: Old zinc, 6.00-6.50; new die-cast scrap, 6.00; old die-cast scrap, 3.50.

REFINER'S BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 22.25-22.50; 3003 clippings, 22.00-22.50; 6151 clippings, 21.50-21.75; 5052 clippings, 21.50-21.75; 2014 clippings, 21.00-21.75; 2017 clippings, 21.00-21.75; 2024 clippings, 21.00-21.75; mixed clippings, 21.00-21.50; old sheet, 19.50; old cast, 19.50; clean old cable (free of steel), 21.75-22.50; borings and turnings, 19.50-20.50.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 68.00; light scrap, 63.00; turnings and borings, 48.00.

Copper and Brass: No. 1 heavy copper and wire, 41.50; No. 2 heavy copper and wire, 40.00 light copper, 37.75; refinery brass (60% copper) per dry copper content, 39.00.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 41.50; No. 2 heavy copper and wire, 40.00; light copper, 37.75; No. 1 composition borings, 32.50; No. 1 composition solids, 33.00; heavy yellow brass solids, 23.50; yellow brass turnings, 22.50; radiators, 25.00.

PLATING MATERIAL

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 65.29; oval, 64.42, 5000-10,,000 lb; electrodeposited, 61.25, 2000-5000 lb lots; cast 60.54, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, $1.015; 100-499 lb. 99.50; 500-4999 lb, 95.50; 5000-29,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, deduct 3 cents a lb. All prices eastern delivery, effective Jan. 1, 1955.

Tin: Bar or slab, less than 200 lb, $1.175; 200-499 lb, $1.160; 500-999 lb, $1.155; 1000 lb or more, $1.150.

Zinc: Balls, 21.00; flat tops, 21.00; flats, 22.75; ovals, 22.00, ton lots.

CHEMICALS

Cadmium Oxide: $2.15 per lb, in 100-lb drums.

Chromic Acid: Less than 10,000 lb, 28.50; over 10,000 lb, 27.50.

Copper Cyanide: 100 lb, 85.25; 200 lb, 84.50; 300 lb, 84.25; 400-900 lb, 83.50; 1000 lb, 81.50.

Copper Cyanide: 100 lb 85.25; 200 lb, 84.50; lb, 15.90; 6000 lb or more, 15.65.

Nickel Chloride: 100 lb, 46.50; 200 lb, 44.50; 300 lb, 43.50; 400-4900 lb. 41.50; 5000-9900 lb, 39.50; 10,000 lb and over, 38.50. All prices eastern delivery, effective Jan. 1, 1955.

Nickel Sulphate: 100 lb, 38.25; 200 lb, 36.25; 300 lb, 35.25; 400-4900 lb, 33.25; 5000-35,900 lb, 31.25; 36,000 lb, 30.35. All prices eastern delivery, effective Jan. 1, 1955.

Silver Cyanide: (Cents per ounce) 4-oz bottle, 86.875; 15-oz bottle, 85.625; 80-oz bottle, 83.125; 100-oz bottle, 83.125; f.o.b. St. Louis, New York and Los Angeles. Effective Sept. 30, 1955.

Sodium Cyanide: Egg, under 1000 lb, 19.80; 1000-19,900 lb, 18.80; 20,000 lb, and over, 17.80; granular, add 1-cent premium to above.

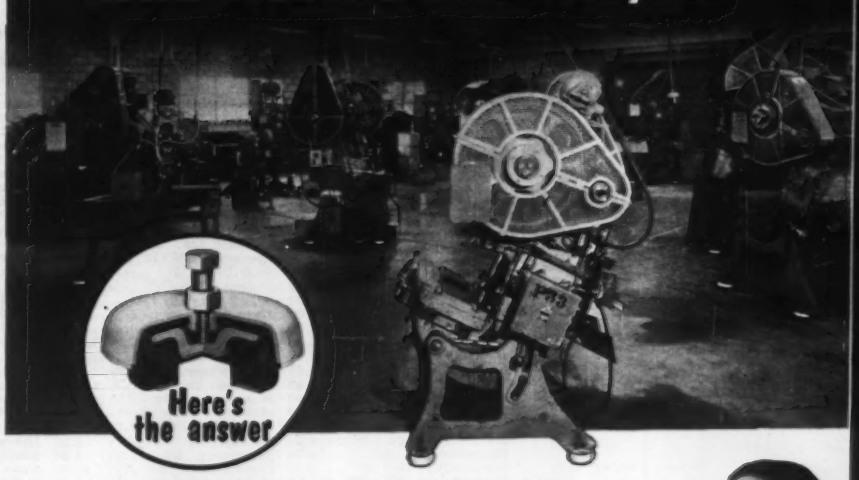
Sodium Stannate: Less than 100 lb, 70.90; 100-600 lb, 62.50; 700-1900 lb, 60.00; 2000-9900 lb, 58.30; 10,000 lb or more, 57.10.

Stannous Chloride (anhydrous): Less than 25 lb, $1.677; 25 lb, $1.327; 100 lb, $1.177; 400 lb, $1.153; 5200-19,600 lb, $1.031; 20,000 lb, 90.90.

Stannous Sulphate: Less than 50 lb, $1.304; 50 lb, $1.004; 100-1900 lb, 98.40; 2000 lb or more, 96.40.

Zinc Cyanide: Under 1000 lb, 54.30; 1000 lb and over, 52.30.

How Biggest Toy Maker of West Cuts Seasonal-Change Costs With Flexible Plant Layout



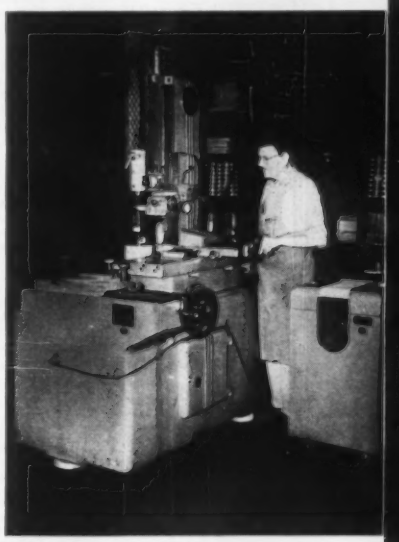
To meet ever-changing production and tooling requirements, Mattel, Inc., uses Leveling Barry Mounts to mobilize its 22 open-back inclinable punch presses ranging from 10- to 60-ton capacity. Now the entire press-room layout is revised whenever the product line changes — because all 22 presses can be relocated in less than a day by three men and an industrial truck. The result — smoother flow of materials, less handling between operations, simplified expansion of press department, easier maintenance, and reduction of noise and vibration transmitted to other parts of the building. Mattel says, "Our Barry Mounts have paid off their investment several times over".

Ask Barry how YOU can boost output by mobilizing machinery.

ATF Proves Barry Mounts Cure Vibration Troubles in Testing Precision Gears

The gages on sensitive gear checkers at American Type Founders went crazy when lift trucks rolled by, and other machines sent vibrations down columns or through walls and floors. But now, with the testers "floating" on Leveling Barry Mounts, gear checking continues without interruption under the worst vibration conditions. For machine tools also, ATF has proved Barry Mounts make it easier to hold close tolerances and to get higher operating speeds by keeping vibration from affecting feeds, cutting tools, or work.

Ask Barry how YOU can protect precision machinery.



Here's How YOU Can Gain These Advantages

Write for our plant survey booklet M-556 that tells you where to look for these kinds of savings in your plant; then talk over your machine-mobility needs and vibration problems with a Barry representative or Barry Mount distributor.

BARRY CONTROLS INCORPORATED

BARRY B MOUNT

SOLD THRU INDUSTRIAL DISTRIBUTORS

926 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

Steel Prices

Mill prices as reported to STEEL, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers, page 171; to footnotes, page 173.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall, Pa. U5 ....$65.50

INGOTS, Alloy (NT)

Detroit R7 .....$69.00
Houston S5 .....74.00
Midland, Pa. C18 .....69.00
Munhall, Pa. U5 .....69.00

BILLETS, BLOOMS & SLABS Carbon, Rerolling (NT)

Aliquippa, Pa. J5 ....$68.50
Bessemer, Pa. U5 .....68.50
Bridgeport, Conn. N19 ..73.50
Buffalo R2 .....68.50
Clairton, Pa. U5 .....68.50
Ensley, Ala. T2 .....68.50
Fairfield, Ala. T2 .....68.50
Fontana, Calif. K1 .....78.00
Gary, Ind. U5 .....68.50
Johnstown, Pa. B2 .....68.50
Lackawanna, N.Y. B2 ..68.50
LoneStar, Tex. L6 ....74.50
Munhall, Pa. U5 .....68.50
Pittsburgh J5 .....68.50
S. Chicago, Ill. R2, U5 ..68.50
S. Duquesne, Pa. U5 ....68.50
Youngstown R2 .....68.50

Carbon, Forging (NT)

Aliquippa, Pa. J5 ....$84.50
Bessemer, Pa. U5 .....84.50
Bridgeport, Conn. N19 ..89.50
Buffalo R2 .....84.50
Canton, O. R2 .....86.50
Clairton, Pa. U5 .....84.50
Conshohocken, Pa. A3 ..89.50
Ensley, Ala. T2 .....84.50
Fairfield, Ala. T2 .....84.50
Fontana, Calif. K1 ....94.00
Gary, Ind. U5 .....84.50
Geneva, Utah C11 .....84.50
Houston S5 .....101.00
Johnstown, Pa. B2 .....84.50
Lackawanna, N.Y. B2 ..84.50
LosAngeles B3 .....94.00
Midland, Pa. C18 .....84.50
Munhall, Pa. U5 .....84.50
Pittsburgh J5 .....84.50
Seattle B3 .....98.00
S. Chicago R2, U5, W14 ..84.50
S. Duquesne, Pa. U5 ....84.50
S. SanFrancisco B3 ....94.00

Alloy, Forging (NT)

Bethlehem, Pa. B2 ....$96.00
Buffalo R2 .....96.00
Canton, O. R2, T7 .....96.00
Conshohocken, Pa. A3..103.00
Detroit R7 .....96.00
Fontana, Calif. K1 ....117.00
Gary, Ind. U5 .....96.00
Houston S5 .....105.00
Ind. Harbor, Ind. Y1 ....96.00
Johnstown, Pa. B2 .....96.00
Lackawanna, N.Y. B2 ..96.00
LosAngeles B3 .....116.00
Massillon, O. R2 .....96.00
Midland, Pa. C18 .....96.00
Munhall, Pa. U5 .....96.00
S. Chicago R2 U5 W14 ..96.00
S. Duquesne, Pa. U5 ....96.00
Struthers, O. Y1 .....96.00
Warren, O. C17 .....96.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2 .....$103.50
Canton, O. R2 .....103.50
Cleveland R2 .....103.50
Gary, Ind. U5 .....103.50
S. Chicago R2, W14 ..103.50
S. Duquesne, Pa. U5 ...103.50

SKELP

Aliquippa, Pa. J5 .....4.325
LoneStar, Tex. L6 .....4.625
Munhall, Pa. U5 .....4.225
SparrowsPoint, Md. B2..4.225
Warren, O. R2 .....4.225
Youngstown R2, U5 ...4.225

WIRE RODS

Alabama City, Ala. h.. ..5.375
Aliquippa, Pa. J5 .....5.375
Alton, Ill. L1 .....5.55
Buffalo W12 .....5.375
Cleveland A7 .....5.375
Donora, Pa. A7 .....5.375
Fairfield, Ala. T2 .....5.375
Houston S5 .....5.625
Indiana Harbor, Ind. Y1..5.375
Johnstown, Pa. B2 .....5.375
Joliet, Ill. A7 .....5.375
Kansas City, Mo. S5 ....5.625
Kokomo, Ind. C16 ....5.475
Los Angeles B3 .....6.175
Minnequa, Colo. C10 ...5.625
Monessen, Pa. P7 .....5.375
N. Tonawanda, N.Y. B11 5.375
Pittsburg, Calif. C11 ...6.025
Portsmouth, O. P12 ....5.375
Roebling, N.J. R5 ....5.475
S. Chicago, Ill. R2 .....5.375
SparrowsPoint, Md. B2..5.475
Sterling, Ill. (1) N15 .....5.375
Sterling, Ill. N15 .....5.475
Struthers, O. Y1 .....5.375
Worcester, Mass. A7 ...5.675

STRUCTURALS

Carbon Steel Std. Shapes

Ala. City, Ala. R2 .....4.60
Aliquippa, Pa. J5 .....4.60
Bessemer, Ala. T2 .....4.60
Bethlehem, Pa. B2 .....4.65
Birmingham C15 .....5.10
Clairton, Pa. U5 .....4.60
Fairfield, Ala. T2 .....4.60
Fontana, Calif. K1 .....5.30
Gary, Ind. U5 .....4.60
Geneva, Utah C11 .....4.60
Houston S5 .....4.70
Ind. Harbor, Ind. I-2 .....4.60
Johnstown, Pa. B2 .....4.65
KansasCity, Mo. S5 .....4.70
Lackawanna, N.Y. B2 ..4.65
LosAngeles B3 .....5.30
Minnequa, Colo. C10 .....4.90
Munhall, Pa. U5 .....4.60
Niles, Calif. P1 .....5.25
Phoenixville, Pa. P4 ....5.15
Portland, Oreg. O4 .....5.35
Seattle B3 .....5.35
S. Chicago U5, W14 .....4.60
S. SanFrancisco B3 ....5.25
Torrance, Calif. C11 ....5.30
Weirton, W. Va. W6 ....4.60

Wide Flange

Bethlehem, Pa. B2 .....4.65
Clairton, Pa. U5 .....4.60
Fontana, Calif. K1 .....5.45
Lackawanna, N.Y. B2 ..4.65
Munhall, Pa. U5 .....4.60
Phoenixville, Pa. P4 ....5.15
S. Chicago, Ill. U5 .....4.60

Alloy Std. Shapes

Clairton, Pa. U5 .....5.65
Fontana, Calif. K1 .....7.40
Gary, Ind. U5 .....5.65
Houston S5 .....5.75
Munhall, Pa. U5 .....5.65
S. Chicago, Ill. U5 .....5.65

H.S., L.A. Std. Shapes

Aliquippa, Pa. J5 .....6.75
Bessemer, Ala. T2 .....6.75
Bethlehem, Pa. B2 .....6.80
Clairton, Pa. U5 .....6.75
Fairfield, Ala. T2 .....6.75
Fontana, Calif. K1 .....7.45
Gary, Ind. U5 .....6.75
Geneva, Utah C11 .....6.75
Houston S5 .....6.85
Ind. Harbor, Ind. I-2, Y1..6.75
Johnstown, Pa. B2 .....6.80
KansasCity, Mo. S5 .....6.85
Lackawanna, N.Y. B2 ...6.80
LosAngeles B3 .....7.45
Munhall, Pa. U5 .....6.75
Seattle B3 .....7.50
S. Chicago, Ill U5, W14..6.75
S. SanFrancisco B3 ....7.40
Struthers, O. Y1 .....6.75

H.S., L.A. Wide Flange

Bethlehem, Pa. B2 .....6.80
Lackawanna, N.Y. B2 ...6.80
Munhall, Pa. U5 .....6.75
S. Chicago, Ill. U5 .....6.75

PILING

BEARING PILES

Bethlehem, Pa. B2 ....4.65
Lackawanna, N.Y. B2 ...4.65
Munhall, Pa. U5 .....4.60
S. Chicago, Ill. U5 .....4.60

STEEL SHEET PILING

Ind. Harbor, Ind. I-2 ....5.45
Lackawanna, N.Y. B2 ...5.45
Munhall, Pa. U5 .....5.45
S. Chicago, Ill. U5 .....5.45

PLATES

PLATES, Carbon Steel

Ala. City, Ala. R2 .....4.50
Aliquippa, Pa. J5 .....4.50
Ashland, Ky. (15) A10 ...4.50
Bessemer, Ala. T2 .....4.50
Bridgeport, Conn. N19 ..4.75
Buffalo R2 .....4.50
Clairton, Pa. U5 .....4.50
Claymont, Del. C22 ....4.80
Cleveland J5, R2 .....4.60
Coatesville, Pa. L7 .....4.80
Conshohocken, Pa. A3 ...4.50
Detroit M1 .....4.60
Ecorse, Mich. G5 .....4.60
Fairfield, Ala. T2 .....4.50
Fontana, Calif. (30) K1 ..5.20
Gary, Ind. U5 .....4.50
Geneva, Utah C11 .....4.50
GraniteCity, Ill. G4 .....4.70
Harrisburg, Pa. P4 ....5.10
Houston S5 .....4.60
Ind. Harbor, Ind. I-2, Y1..4.50
Johnstown, Pa. B2 .....4.50
Lackawanna, N.Y. B2 ..4.50
LoneStar, Tex. L6 .....4.85
Mansfield, O. E6 .....4.50
Minnequa, Colo. C10 ....5.35
Munhall, Pa. U5 .....4.50
Newport, Ky. N9 .....4.50
Pittsburgh J5 .....4.50
Riverdale, Ill. A1 .....4.725
Seattle B3 .....5.40
Sharon, Pa. S3 .....4.50
S. Chicago R2, U5, W14...4.50
SparrowsPoint, Md. B2..4.50
Steubenville, O. W10 ....4.50
Warren, O. R2 .....4.50
Weirton, W. Va. W6 ....4.50
Youngstown R2, U5, Y1..4.50

PLATES, Carbon Abras. Resist.

Claymont, Del. C22 ....5.65
Fontana, Calif. K1 .....6.35
Geneva, Utah C11 .....5.65
Johnstown, Pa. B2 .....5.65
SparrowsPoint, Md. B2 ..5.65

PLATES, Wrought Iron

Economy, Pa. B14 .....10.40

PLATES, High Strength Low-Alloy

Aliquippa, Pa. J5 .....6.725
Bessemer, Ala T2 .....6.725
Clairton, Pa. U5 .....6.725
Cleveland J5, R2 .....6.725
Claymont, Del. C22 ....6.725
Coatesville, Pa. L7 ....7.025
Conshohocken, Pa. A3 ..6.725
Ecorse, Mich. G5 .....6.825
Fairfield, Ala. T2 .....6.725
Fontana, Calif. (30) K1 .7.425
Gary, Ind. U5 .....6.725
Geneva, Utah C11 .....6.725
Houston S5 .....6.825
Ind. Harbor, Ind. I-2, Y1..6.725
Johnstown, Pa. B2 .....6.725
Munhall, Pa. U5 .....6.725
Pittsburgh J5 .....6.725
Seattle B3 .....7.625
Sharon, Pa. S3 .....6.725
S. Chicago, Ill. U5, W14..6.725
SparrowsPoint, Md. B2..6.725
Warren, O. R2 .....6.725
Youngstown U5, Y1 ....6.725

PLATES, Alloy

Bridgeport, Conn. N19 ...6.55
Claymont, Del. C22 ....6.30
Coatesville, Pa. L7 .....6.30
Fontana, Calif. K1 .....7.00
Gary, Ind. U5 .....6.30
Houston S5 .....6.40
Ind. Harbor, Ind. Y1 ....6.30
Johnstown, Pa. B2 .....6.30
Munhall, Pa. U5 .....6.30
Newport, Ky. N9 .....6.30
Seattle B3 .....7.20
Sharon, Pa. S3 .....6.30
S. Chicago, Ill. U5, W14..6.30
SparrowsPoint, Md. B2 ..6.30
Youngstown Y1 .....6.30

FLOOR PLATES

Cleveland J5 .....5.575
Conshohocken, Pa. A3 ..5.575
Harrisburg, Pa. P4 ....5.575
Ind. Harbor, Ind. I-2 ...5.575
Munhall, Pa. U5 .....5.575
S. Chicago, Ill. U5 .....5.575

PLATES, Ingot Iron

Ashland c.l. (15) A10...4.75
Ashland l.c.l. (15) A10..5.25
Cleveland c.l. R2 .....5.10
Warren, O. c.l. R2 ....5.10

BARS

(Commercial Quality)

BARS, Hot-Rolled Carbon

Ala. City, Ala. (9) R2 ....4.65
Aliquippa, Pa. (9) J5 ....4.65
Alton, Ill. L1 .....4.85
Atlanta A11 .....4.85
Bessemer, Ala. (9) T2 ....4.65
Birmingham C15 .....5.15
Bridgeport, Conn. N19 ..4.80
Buffalo (9) R2 .....4.65
Canton, O. (9) R2 .....4.75
Clairton, Pa. (9) U5 ....4.65
Cleveland (9) R2 .....4.65
Ecorse, Mich. (9) G5 ....4.75
Emeryville, Calif. J7 ....5.40
Fairfield, Ala. (9) T2 ....4.65
Fairless, Pa. (9) U5 ....4.80
Fontana, Calif. K1 ....5.35
Gary, Ind. (9) U5 .....4.65
Houston (9) S5 .....4.90
Ind. Harbor, Ind. (9) I-2..4.65
Ind. Harbor, Ind. Y1 ....4.65
Johnstown, Pa. (9) B2 ....4.65
Joliet, Ill. P22 .....5.15
KansasCity, Mo. (9) S5 ..4.90
Lackawanna (9) B2 ....4.65
LosAngeles (9) B3 ....5.35
Massillon, O. (9) R2 ....4.75
Midland, Pa. (9) C18 ....4.65
Milton, Pa. M18 .....4.80
Minnequa, Colo. C10 ....5.10
Niles, Calif. P1 .....5.35
N. T'wanda, N.Y. (9) B11 4.65
Pittsburg, Calif. (9) C11..5.35
Pittsburgh (9) J5 .....4.65
Portland, Oreg. O4 ....5.40
Seattle B3, N14 .....5.40
S. Chicago W14 .....4.65
S. Chicago, Ill. (9) R2, U5 4.65
S. Duquesne, Pa. (9) U5 ..4.65
S. SanFran., Calif. (9) B3 5.40
Sterling, Ill. (1) N15 ....4.65
Sterling, Ill. N15 .....4.75
Struthers, O. Y1 .....4.65
Torrance, Calif (9) C11 ..5.35
Warren, O. (9) R2 .....4.65
Weirton, W. Va. (9) W6 ..4.65
Youngston (9) R2, U5 ..4.65

BARS, H.R. Leaded Alloy

Warren, O. C17 .....6.575

BARS, Hot-Rolled Alloy

Bethlehem, Pa. B2 .....5.575
Bridgeport, Conn. N19 ..5.725
Buffalo R2 .....5.575
Canton, O. R2, T7 ....5.575
Clairton, Pa. U5 .....5.575
Detroit R7 .....5.575
Ecorse, Mich. G5 .....5.675
Fairless, Pa. U5 .....5.725
Fontana, Calif. K1 ....6.625
Gary, Ind. U5 .....5.575
Houston S5 .....5.825
Ind. Harbor, Ind. I-2, Y1..5.575
Johnstown, Pa. B2 .....5.575
KansasCity, Mo. S5 ....5.825
Lackawanna, N.Y. B2..5.575
LosAngeles B3 .....6.625
Massillon, O. R2 .....5.575
Midland, Pa. C18 .....5.575
S. Chicago R2, U5, W14..5.575
S. Duquesne, Pa. U5 ....5.575
Struthers, O. Y1 .....5.575
Warren, O. C17 .....5.575
Youngstown U5 .....5.575

BARS & SMALL SHAPES, H.R. High-Strength Low-Alloy

Aliquippa, Pa. J5 .....6.80
Bessemer, Ala. T2 .....6.80
Bethlehem, Pa. B2 .....6.80
Clairton, Pa. U5 .....6.80
Cleveland R2 .....6.80
Ecorse, Mich. G5 .....6.90
Fairfield, Ala. T2 .....6.80
Fontana, Calif. K1 .....7.50
Gary, Ind. U5 .....6.80
Houston S5 .....7.05
Ind. Harb., Ind. I-2, Y1..6.80
Johnstown, Pa. B2 .....6.80
KansasCity, Mo. S5 ....7.05
Lackawanna, N.Y. B2 ...6.80
LosAngeles B3 .....7.50
Pittsburgh J5 .....6.80
Seattle B3 .....7.55
S. Chicago W14 .....6.80
S. Duquesne, Pa. U5 ....6.80
S. SanFrancisco B3 ....7.55
Struthers, O. Y1 .....6.80
Warren, O. R2 .....6.80
Youngstown U5 .....6.80

BAR SIZE ANGLES; H.R. Carbon

Bethlehem, Pa. (9) B2 ...4.80
Lackawanna (9) B2 ....4.65

BAR SIZE ANGLES; S. Shapes

Aliquippa, Pa. J5 .....4.65
Atlanta A11 .....4.85
Fontana, Calif. K1 ....5.35
Joliet, Ill. P22 .....5.10
Niles, Calif. P1 .....5.35
Pittsburgh J5 .....4.65
Portland, Oreg. O4 .....5.40
SanFrancisco S7 .....5.05

BAR SHAPES, Hot-Rolled Alloy

Clairton, Pa. U5 .....5.65
Gary, Ind. U5 .....5.65
Houston S5 .....5.90
KansasCity, Mo. S5 ....5.90
Youngstown U5 .....5.65

BARS, C.F. Leaded Alloy

Ambridge, Pa. W18 ....8.325
Camden, N.J. P13 .....8.35
Chicago W18 .....8.325
Cleveland C20 .....8.325
Monaca, Pa. S17 .....8.325
Newark, N.J. W18 .....8.50
SpringCity, Pa. K3 .....8.30
Warren, O. C17 .....8.575

BARS, Cold-Finished Carbon

Ambridge, Pa. W18 .....6.25
BeaverFalls, Pa. M12, R2 6.25
Buffalo B5 .....6.30
Camden, N.J. P13 .....6.70
Carnegie, Pa. C12 .....6.25
Chicago W18 .....6.25
Cleveland A7, C20 .....6.25
Detroit B5, P17 .....6.45
Detroit R7 .....6.25
Donora, Pa. A7 .....6.25
Elyria, O. W8 .....6.25
FranklinPark, Ill. N5 ....6.25
Gary, Ind. R2 .....6.25
GreenBay, Wis. F7 .....6.25
Hammond, Ind. L2, M13..6.25
Hartford, Conn. R2 ....6.75
Harvey, Ill. B5 .....6.25
LosAngeles (49) S30 ....7.70
LosAngeles R2 .....7.70
Mansfield, Mass. B5 ....6.80
Massillon, O. R2, R8 ....6.25
Midland, Pa. C18 .....6.25
Monaca, Pa. S17 .....6.25
Newark, N.J. W18 .....6.70
NewCastle, Pa. (17) B4..6.25
Pittsburgh J5 .....6.25
Plymouth, Mich. P5 ....6.50
Putnam, Conn. W18 ....6.80
Readville, Mass. C14 ....6.80
S. Chicago, Ill. W14 ....6.25
SpringCity, Pa. W3 .....6.70
Struthers, O. Y1 .....6.25
Waukegan, Ill. A7 .....6.25
Worcester, Mass. W19 ...6.70
Youngstown F3, Y1 ...6.25

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland, Md. (5) C19..5.16

BARS, Cold-Finished Alloy

Ambridge, Pa. W18 ....7.425
BeaverFalls, Pa. M12, R2 7.425
Bethlehem, Pa. B2 .....7.425
Buffalo B5 .....7.425
Camden, N.J. P13 .....7.60
Canton, O. T7 .....7.425
Carnegie, Pa. C12 .....7.425
Chicago W18 .....7.425
Cleveland A7, C20 .....7.425
Detroit R7 .....7.425
Detroit B5, P17 .....7.625
Donora, Pa. A7 .....7.425
Elyria, O. W8 .....7.425
Gary, Ind. R2 .....7.425
GreenBay, Wis. F7 ....7.425
Hammond, Ind. L2, M13..7.425
Hartford, Conn. R2 ....7.725
Harvey, Ill. B5 .....7.425
Lackawanna, N.Y. B2 ..7.425
LosAngeles S30 .....9.10
Mansfield, Mass. B5 ....7.725
Massillon, O. R2, R8 ....7.425
Midland, Pa. C18 .....7.425
Monaca, Pa. S17 .....7.425
Newark, N.J. W18 .....7.60
Plymouth, Mich. P5 ....7.625
S. Chicago W14 .....7.425
SpringCity, Pa. K3 .....7.60
Struthers, O. Y1 .....7.425
Warren, O. C17 .....7.425
Waukegan, Ill. A7 .....7.425
Worcester, Mass. A7 ...7.725
Youngstown F3, Y1 ...7.425

BARS, Reinforcing (To Fabricators)

Ala. City, Ala. R2 .....4.65
Atlanta A11 .....4.85
Birmingham C15 .....5.15
Buffalo R2 .....4.65
Cleveland R2 .....4.65
Ecorse, Mich. G5 .....4.75
Emeryville, Calif. J7 ....5.40
Fairfield, Ala. T2 .....4.65
Fairless, Pa. U5 .....4.80
Fontana, Calif. K1 ....5.35
Ft. Worth, Tex. (42) T4 ..5.10
Gary, Ind. U5 .....4.65
Houston S5 .....4.90

Ind. Harbor, Ind. I-2, Y1 4.65
Johnstown, Pa. B2 4.65
Joliet, Ill. P22 5.15
Kansas City, Mo. S5 4.90
Lackawanna, N.Y. B2 4.65
Los Angeles B3 5.35
Milton, Pa. M18 4.80
Minnequa, Colo. C10 5.10
Niles, Calif. P1 5.35
Pittsburg, Calif. C11 5.35
Pittsburgh J5 4.65
Portland, Oreg. O4 5.40
Sand Springs, Okla. S5 5.15
Seattle B3, N14 5.40
S. Chicago R2 4.65
S. Duquesne, Pa. U5 4.65
S. San Francisco B3 5.40
Sparrows Point, Md. B2 4.65
Sterling, Ill. (1) N15 4.65
Sterling, Ill. N15 4.75
Struthers, O. Y1 4.65
Torrance, Calif. C11 5.35
Youngstown R2, U5 4.65

BARS, Reinforcing
(Fabricated; to Consumers)

Johnstown, Pa. ¼-1" B2 6.15
Kansas City, Kans. S5 6.45
Lackawanna, N.Y. B2 6.17
Marion, O. P11 6.15
Pittsburgh U8 6.17
Seattle B3, N14 6.60
Sparrows Pt. ½-1" B2 6.15
Williamsport, Pa. S19 6.00

RAIL STEEL BARS

Chicago Hts. (3) C2, I-2 4.65
Chicago Hts. (4) C2, I-2 4.65
Ft. Worth, Tex. (26) T4 5.10
Franklin, Pa (3) F5 4.65
Franklin, Pa. (4) F5 4.65
Jersey Shore, Pa. (4) J8 4.65
Marion, O. (3) P11 4.65
Moline, Ill. (3) R2 4.80
Tonawanda (3) B12 4.65
Tonawanda (4) B12 5.15
Williamsport, Pa. (3) S19 4.65

BARS, Wrought Iron

Economy, Pa. (S.R.) B14 11.50
Economy, Pa. (D.R.) B14 14.30
Economy (Staybolt) B14 14.65
McK. Rks. (S.R.) L5 11.50
McK. Rks. (D.R.) L5 16.00
McK. Rks. (Staybolt) L5 17.00

SHEETS

SHEETS, Hot-Rolled Steel
(18 Gage and Heavier)

Ala. City, Ala. R2 4.325
Allenport, Pa. P7 4.325
Ashland, Ky. (8) A10 4.325
Cleveland J5, R2 4.325
Conshohocken, Pa. A3 4.375
Detroit (8) M1 4.425
Dravosburg, Pa. U5 4.325
Ecorse, Mich. G5 4.425
Fairfield, Ala. T2 4.325
Fairless, Pa. U5 4.375
Fontana, Calif. K1 5.125
Gary, Ind. U5 4.325
Geneva, Utah C11 4.425
Granite City, Ill. G4 4.525
Ind. Harbor, Ind. I-2, Y1 4.325
Lackawanna, N.Y. B2 4.325
Mansfield, O. E6 (37) 4.325
Munhall, Pa. U5 4.325
Newport, Ky. (8) N9 4.325
Niles, O. M21 4.325
Pittsburg, Calif. C11 5.025
Pittsburgh J5 4.325
Portsmouth, O. P12 4.325
Riverdale, Ill. A1 4.55
Sharon, Pa. S3 4.325
S. Chicago, Ill. W14 4.325
Sparrows Point, Md. B2 4.325
Steubenville, O. W10 4.325
Warren, O. R2 4.325
Weirton, W. Va. W6 4.325
Youngstown U5, Y1 4.325

SHEETS, H.R. (19 Ga. & Lighter)

Ala. City, Ala. R2 5.625
Niles, O. M21 5.325

SHEETS, H.R. Alloy

Ind. Harbor, Ind. Y1 7.20
Youngstown Y1 7.20

SHEETS, H.R. (14 Ga. & Heavier)
High-Strength Low-Alloy

Cleveland J5, R2 6.375
Conshohocken, Pa. A3 6.425
Dravosburg, Pa. U5 6.375
Ecorse, Mich. G5 6.475
Fairfield, Ala. T2 6.375
Fairless, Pa. U5 6.425
Fontana, Calif. K1 7.175
Gary, Ind. U5 6.375
Ind. Harbor, Ind. I-2, Y1 6.375
Lackawanna (35) B2 6.375
Munhall, Pa. U5 6.375
Pittsburgh J5 6.375
Sharon, Pa. S3 6.375
S. Chicago, Ill. U5 6.375
Sparrows Point (36) B2 6.375
Warren, O. R2 6.375
Youngstown U5, Y1 6.375

SHEETS, Hot-Rolled Ingot Iron
(18 Gage and Heavier)

Ashland, Ky. (8) A10 4.575
Ind. Harbor, Ind. I-2 4.575

SHEETS, Cold-Rolled Steel
(Commercial Quality)

Allenport, Pa. P7 5.325
Cleveland J5, R2 5.325
Conshohocken, Pa. A3 5.375
Dravosburg, Pa. U5 5.325
Detroit M1 5.325
Ecorse, Mich. G5 5.425
Fairfield, Ala. T2 5.325
Fairless, Pa. U5 5.375
Follansbee, W. Va. F4 5.325
Fontana, Calif. K1 6.525
Gary, Ind. U5 5.325
Granite City, Ill. G4 5.525
Ind. Harbor, Ind. I-2, Y1 5.325
Lackawanna, N.Y. B2 5.325
Mansfield, O. E6 5.325
Middletown, O. A10 5.325
Newport, Ky. N9 5.325
Pittsburg, Calif. C11 6.275
Pittsburgh J5 5.325
Portsmouth, O. P12 5.325
Sparrows Point, Md. B2 5.325
Steubenville, O. W10 5.325
Warren, O. R2 5.325
Weirton, W. Va. W6 5.325
Youngstown Y1 5.325

SHEETS, Cold-Rolled
High-Strength Low-Alloy

Cleveland J5, R2 7.875
Dravosburg, Pa. U5 7.875
Ecorse, Mich. G5 7.975
Fairless, Pa. U5 7.925
Fontana, Calif. K1 9.075
Gary, Ind. U5 7.875
Indiana Harbor, Ind. Y1 7.875
Lackawanna (37) B2 7.875
Pittsburgh J5 7.875
Sparrows Point (38) B2 7.875
Warren, O. R2 7.875
Weirton, W. Va. W6 7.875
Youngstown Y1 7.875

SHEETS, Cold-Rolled Ingot Iron

Middletown, O. A10 5.825

SHEETS, Culvert (16 Gage)

	Cu	Cu
	Alloy	Fe
Ashland, Ky.	A10 6.90	...
Canton, O.	R2 6.10	6.55
Dravosburg	U5 6.10	...
Fairfield	T2 6.10	...
Gary, Ind.	U5 6.10	6.35
Ind. Harbor	I-2 6.10	6.35
Kokomo, Ind.	C16 6.20	...
Martins Fry.	W10 6.10	...
Newport, Ky.	N9 6.10	6.35
Pitts., Calif.	C11 6.85	...
Sparrows Pt.	B2 6.10	...

SHEETS, Culvert—Pure Iron

Ashland, Ky. A10 7.15
Gary, Ind. U5 6.35
Martins Fry, O. W10 6.35

SHEETS, Galvanized Steel
Hot-Dipped

Ala. City, Ala. R2 5.85‡
Ashland, Ky. A10 5.85†
Canton, O. R2 5.85‡
Dover, O. R1 5.85†
Dravosburg, Pa. U5 5.85†
Fairfield, Ala. T2 5.85†
Gary, Ind. U5 5.85*
Granite City, Ill. G4 6.05
Ind. Harbor, Ind. I-2 5.85†
Kokomo, Ind. C16 5.95‡
Martins Ferry, O. W10 5.85*
Middletown, O. A10 5.85†
Newport, Ky. N9 5.85‡
Pittsburg, Calif. C11 6.60*
Pittsburgh J5 5.85†
Sparrows Pt., Md. B2 5.85†
Warren, O. R2 5.85†
Weirton, W. Va. W6 5.85*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana, Calif. K1 6.625

SHEETS, Galvanized
High-Strength Low-Alloy

Dravosburg, Pa. U5 8.60
Sparrows Point (39) B2 8.60

SHEETS, Galvannealed Steel

Canton, O. R2 6.25
Dravosburg, Pa. U5 6.25
Kokomo, Ind. C16 6.60
Newport, Ky. N9 6.25

SHEETS, Galvanized Ingot Iron
(Hot-dipped Continuous)

Ashland, Ky. A10 6.10
Middletown, O. A10 6.10

SHEETS, Electrogalvanized

Cleveland (28) R2 6.70
Niles, O. (28) R2 6.70
Weirton, W. Va. W6 6.55

SHEETS, Aluminum Coated

Butler, Pa. A10 (type 1) 8.50
Butler, Pa. A10 (type 2) 8.60

SHEETS, Enameling Iron

Ashland, Ky. A10 5.90
Cleveland R2 5.90
Dravosburg, Pa. U5 5.90
Gary, Ind. U5 5.90
Granite City, Ill. G4 6.10
Ind. Harbor, Ind. I-2 5.90
Middletown, O. A10 5.90
Niles, O. M21 5.90
Youngstown Y1 5.90

BLUED STOCK, 29 Gage

Follansbee, W. Va. F4 7.75
Ind. Habor, Ind. I-2 7.75
Yorkville, O. W10 7.75

SHEETS, Long Terne Steel
(Commercial Quality)

Beech Bottom, W. Va. W10 6.25
Gary, Ind. U5 6.25
Mansfield, O. E6 6.25
Middletown, O. A10 6.25
Niles, O. M21 6.25
Weirton, W. Va. W6 6.25

SHEETS, Long Terne, Ingot Iron

Middletown, O. A10 6.65

Key To Producers

A1 Acme Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.

B1 Babcock & Wilcox Co.
B2 Bethlehem Steel Co.
B3 Beth. Pac. Coast Steel
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div. Colo. Fuel & Iron
B11 Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div. Borg-Warner Corp.
C4 Carpenter Steel Co.
C7 Cleve. Cold Rolling Mills
C8 Cold Metal Products Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div. H. K. Porter Co. Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.

D2 Detroit Steel Corp.
D3 Detroit Tube & Steel Div., Sharon Steel Corp.
D4 Disston & Sons, Henry
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas&Fuel Assoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire Steel Corp.

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div. Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel&Wire
F8 Ft. Wayne Metals Inc.

G2 Globe Iron Co.
G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins, E., Steel Tube
I-7 Indiana Steel&Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel&Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L5 Lockhart Iron & Steel
L6 Lone Star Steel Co.
L7 Lukens Steel Co.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M13 Monarch Steel Div., Jones & Laughlin Steel Corp.
M14 McInnes Steel Co.
M16 Md. Fine&Special Wire
M17 Metal Forming Corp.
M18 Milton Steel Prod. Div., Merritt-Chapman&Scott
M21 Mallory-Sharon Titanium Corp.

N1 National-Standard Co.
N2 National Supply Co.
N3 National Tube Div., U.S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New Eng. High Carb. Wire
N8 Newman-Crosby Steel
N9 Newport Steel Corp.
N14 Northwest. Steel Roll. Mills
N15 Northwestern S.&W. Co.
N16 New Delphos Mfg. Co.
N19 Northeastern Steel Corp.

O3 Oliver Iron & Steel Corp.
O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co. Sub. of Barium Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke&Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Division, Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts. Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., Amer. Chain & Cable
P17 Plymouth Steel Co.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.

R1 Reeves Steel & Mfg. Co.
R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R7 Rotary Electric Steel Co.
R8 Reliance Div., Eaton Mfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Senaca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Steel Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Corp.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service

T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Prod. & Chem.
T4 Texas Steel Co.
T5 Thomas Strip Division, Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div. Am. Rad. & Stan. San.
T13 Tube Methods Inc.

U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless steels
U8 U. S. Steel Supply Div. U. S. Steel Corp.

V2 Vanadium-Alloys Steel
V3 Vulcan Crucible Division, H. K. Porter, Inc.

W1 Wallace Barnes Co.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W7 W. Va. Steel&Mfg. Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.
W19 Worcester Pressed Steel

Y1 Youngstown Sheet&Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2	4.325
Allenport,Pa. P7	4.325
Alton,Ill. L1	4.50
Ashland,Ky.(8) A10	4.325
Atlanta A11	4.525
Bessemer,Ala. T2	4.325
Birmingham C15	4.825
Bridgeport,Conn. N19	4.625
Buffalo(27) R2	4.325
Conshohocken,Pa. A3	4.375
Detroit M1	4.425
Ecorse,Mich. G5	4.425
Fairfield,Ala. T2	4.325
Fontana,Calif. K1	5.125
Gary,Ind. U5	4.325
Ind.Harbor,Ind. I-2,Y1	4.325
Johnstown,Pa.(25) B2	4.325
Lackaw'na,N.Y.(24) B2	4.325
LosAngeles(25) B3	5.075
Milton,Pa. M18	4.325
Minnequa,Colo. C10	5.425
Pittsburg,Calif. C11	5.075
Riverdale,Ill. A1	4.55
SanFrancisco S7	5.05
Seattle(25) B3	5.325
Seattle N14	5.40
Sharon,Pa. S3	4.325
S.Chicago,Ill. W14	4.325
S.SanFrancisco(25) B3	5.075
SparrowsPoint,Md. B2	4.325
Sterling(1) N15	4.325
Sterling,Ill. N15	4.425
Torrance,Calif. C11	5.075
Warren,O. R2	4.325
Weirton,W.Va. W6	4.325
Youngstown U5	4.325

STRIP, Hot-Rolled Alloy

Bridgeport,Conn. N19	7.50
Carnegie,Pa. S18	7.20
Fontana,Calif. K1	8.95
Gary,Ind. U5	7.20
Ind.Harbor,Ind. Y1	7.20
LosAngeles B3	8.40
Newport,Ky. N9	7.20
Sharon,Pa. S3	7.20
S.Chicago W14	7.20
Youngstown U5, Y1	7.20

STRIP, Hot-Rolled High-Strength Low-Alloy

Bessemer,Ala. T2	6.425
Conshohocken,Pa. A3	6.425
Ecorse,Mich. G5	6.525
Fairfield,Ala. T2	6.425
Fontana,Calif. K1	7.575
Gary,Ind. U5	6.425
Houston S5	6.675
Ind.Harbor,Ind. I-2,Y1	6.425
KansasCity,Mo. S5	6.675
Lackawanna,N.Y. B2	6.425
LosAngeles(25) B3	7.175
Seattle(25) B3	7.425
Sharon,Pa. S3	6.425
S.SanFrancisco(25) B3	7.175
SparrowsPoint,Md. B2	6.425
Warren,O. R2	6.425
Weirton,W.Va. W6	6.425
Youngstown U5, Y1	6.425

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	4.575

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	6.25
Baltimore T6	6.25
Boston T6	6.80
Buffalo S40	6.25
Cleveland A7, J5	6.25
Conshohocken,Pa. A3	6.30
Dearborn,Mich. D3	6.35
Detroit D2, M1, P20	6.35
Dover,O. G6	6.25
Ecorse,Mich. G5	6.35
Follansbee,W.Va. F4	6.25
Fontana,Calif. K1	8.00
FranklinPark,Ill. T6	6.35
Ind.Harbor,Ind. I-2	6.35
Ind.Harbor,Ind. Y1	6.25
Indianapolis C8	6.40
Lackawanna,N.Y. B2	6.25
LosAngeles C1	8.30
NewBedford,Mass. R10	6.70
NewBritain(10) S15	6.25
NewCastle,Pa. B4, E5	6.25
NewHaven,Conn. A7, D2	6.70
NewKensington,Pa. A6	6.25
Pawtucket,R.I. R3	6.90
Pawtucket,R.I. N8	6.80
Pittsburgh J5	6.25
Riverdale,Ill. A1	6.35
Rome,N.Y.(32) R6	6.25
Sharon,Pa. S3	6.25
SparrowsPt.,Md. B2	6.25
Trenton,N.J.(31) R5	7.80
Wallingford,Conn. W2	6.70
Warren,O. R2, T5	6.25
Weirton,W.Va. W6	6.25
Worcester,Mass. A7	6.80
Youngstown C8, Y1	6.25

STRIP, Cold-Rolled Alloy

Boston T6	13.80
Carnegie,Pa. S18	13.45
Cleveland A7	13.45
Dover,O. G6	13.45
FranklinPark,Ill. T6	13.45
Harrison,N.J. C18	13.45
Indianapolis C8	13.60
Pawtucket,R.I. N8	13.80
Sharon,Pa. S3	13.45
Worcester,Mass. A7	13.75
Youngstown C8	13.45

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	9.10
Dearborn,Mich. D3	9.20
Dover,O. G6	9.30
Ecorse,Mich. G5	9.20
Ind.Harbor,Ind. Y1	9.30

STRIP, Cold-Finished Spring Steel (Annealed)

	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	7.40	9.35	10.90	13.05	15.75
Boston T6	7.65	9.35	10.90	13.05	15.75
Bristol,Conn. W1	...	...	10.90	13.05	15.75
Carnegie,Pa. S18	...	9.05	10.60	12.75	....
Cleveland A7	7.10	9.05	10.60	12.75	15.45
Cleveland C7	...	9.05	10.60	12.75	15.45
Dearborn,Mich. D3	7.20	9.15	10.70	....	....
Detroit D2	7.20	9.15	10.70	12.85	....
Dover,O. G6	7.10	9.05	10.60	12.75	15.45
FranklinPark,Ill. T6	7.20	9.05	10.60	12.75	15.45
Harrison,N.J. C18	...	...	10.90	13.05	15.75
Indianapolis C8	7.25	9.20	10.60	12.75	15.45
NewBritain,Conn.(10) S15	7.10	9.05	10.60	12.75	15.45
NewCastle,Pa. B4, E5	7.10	9.05	10.60	12.75	....
NewHaven,Conn. D2	7.55	9.35	10.90	13.05	....
NewKensington,Pa. A6	7.10	9.05	10.60	....	....
New York W3	...	9.35	10.90	13.05	15.75
Pawtucket,R.I. N8	7.65	9.35	10.90	13.05	15.75
Riverdale,Ill. A1	7.20	9.05	10.60	12.75	15.45
Rome,N.Y.(32) R6	7.10	9.05	10.60	12.75	15.45
Sharon,Pa. S3	7.10	9.05	10.60	12.75	15.45
Trenton,N.J. R5	...	9.35	10.90	13.05	15.75
Wallingford,Conn. W2	7.55	9.35	10.90	13.05	15.75
Warren,O. T5	7.10	9.05	10.60	12.75	15.45
Weirton,W.Va. W6	7.10	9.05	10.60	12.75	15.45
Worcester,Mass. A7, T6	7.65	9.35	10.90	13.05	15.75
Youngstown C8	7.10	9.05	10.60	12.75	15.45

Spring Steel (Tempered)

Bristol,Conn. W1	...	...	14.80	18.15	....
Buffalo W12	...	...	14.80	....	....
FranklinPark,Ill. T6	...	...	15.15	18.50	22.35
Harrison,N.J. C18	...	...	14.80	18.15	22.00
NewYork W3	...	...	14.80	18.15	22.00
Trenton,N.J. R5	...	...	14.80	18.15	22.00
Worcester,Mass. W12	...	...	14.80	....	....
Worcester,Mass. A7, T6	...	...	14.80	18.15	22.00
Youngstown C8	...	...	15.15	18.50	22.35

SILICON STEEL

H.R. SHEETS(22 Ga.,cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	...	...	9.95	10.95	11.85
Brackenridge,Pa. A4	...	...	9.95	10.95	11.85
Mansfield,O. E6	8.40	9.35	9.95	10.95	11.85
Newport,Ky. N9	8.40	9.35	9.95	10.95	11.85
Niles,O. M21	8.40	9.35	9.95	10.95	....
Vandergrift,Pa. U5	...	9.35	9.95	10.95	11.85
Warren,O. R2	8.40	9.35	9.95	10.95	11.85
Zanesville,O. A10	...	9.35	9.95	10.95	11.85

C.R. COILS & CUT LENGTHS, (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge,Pa. A4	...	...	10.70	11.70	12.60
GraniteCity,Ill. G4	8.80*	9.80*	10.40*	11.40	....
IndianaHarbor,Ind. I-2	8.60†	9.60*	10.20*	11.20*	....
Vandergrift,Pa. U5	8.60*	9.60*	10.20*	11.20*	12.10*
Vandergrift,Pa. U5	....	10.10†	10.70†	11.70†	12.60†
Warren,O. R2	8.60†	10.10	10.70	11.70	12.60

	Transformer Grade			
H.R. SHEETS (22 Ga., cut lengths)	T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	12.80	13.35	13.85	14.85
Brackenridge,Pa. A4	12.80	....	....	....
Newport,Ky. N9	12.80	....	....	....
Vandergrift,Pa. U5	12.80	13.35	13.85	14.85
Zanesville,O. A10	12.80§	13.35§	13.85§	14.85§

	Grain Oriented				
C.R. COILS & CUT LENGTHS (22 Ga.)	T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	15.85	17.45	17.95	18.45	13.55**
Bulter,Pa. A10	....	....	17.45	17.95	....	....
Vandergrift,Pa. U5	14.85	15.85	17.45	17.95	....	13.55
Warren,O. R2	....	....	....	....	....	13.55‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. §Coils, ¾-cent higher. **Cut lengths, ¾-cent lower.

Lackawanna,N.Y. B2	9.10
Sharon,Pa. S3	9.10
SparrowsPoint,Md. B2	9.10
Warren,O. R2	9.10
Weirton,W.Va. W6	9.10
Youngstown Y1	9.30

STRIP, Electrogalvanized

Cleveland A7	6.25*
Dover,O. G6	6.25*
Riverdale,Ill. A1	6.35*
Warren,O. T5	6.25*
Warren,O. B9	6.25*
Worcester,Mass. A7	6.80*
Youngstown C8	6.25*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	6.55

TIGHT COOPERAGE HOOP

Atlanta A11	5.05
Riverdale,Ill. A1	4.90
Sharon,Pa. S3	4.75
Youngstown U5	4.75

TIN MILL PRODUCTS

TIN PLATE Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$7.90	$8.15	$8.55
Dravosburg,Pa. U5	7.90	8.15	8.55
Fairfield,Ala. T2	8.00	8.25	8.65
Fairless,Pa. U5	8.00	8.25	8.65
Gary,Ind. U5	7.90	8.15	8.55
GraniteCity,Ill. G4	8.00	8.25	8.65
IndianaHarbor,Ind. I-2, Y1	7.90	8.15	8.55
Niles,O. R2	7.90	8.15	8.55
Pittsburg,Calif. C11	8.65	8.90	9.30
SparrowsPoint,Md. B2	8.00	8.25	8.65
Weirton,W.Va. W6	7.90	8.15	8.55
Yorkville,O. W10	7.90	8.15	8.55

ELECTROTIN (22-27 Gage; Dollars per 100 lb)

Aliquippa,Pa. J5	6.675	....	....
Niles,O. R2	6.675	6.875	7.075

TINPLATE, American	1.25 lb	1.50 lb
Aliquippa,Pa.	J5,9.20	$9.45
Dravosburg,Pa.	U5 9.20	9.45
Fairfield,Ala.	T2, 9.30	9.55
Fairless,Pa.	U5, 9.30	9.55
Gary,Ind.	U5 .... 9.20	9.45
Ind.Har.	I-2, Y1, 9.20	9.45
Pitts.,Calif.	C11.. 9.95	10.20
Sp.Pt.,Md.	B2 ... 9.30	9.55
Weirton,W.Va.	W6 9.20	9.45
Yorkville,O.	W10. 9.20	9.45

BLACK PLATE (Base Box)

Aliquippa,Pa. J5	$7.00
Dravosburg,Pa. U5	7.00
Fairfield,Ala. T2	7.10
Fairless,Pa. U5	7.10
Gary,Ind. U5	7.00
Granite City,Ill. G4	7.10
Ind.Harbor,Ind. I-2, Y1	7.00
Niles,O. R2	7.00
Pittsburg,Calif. C11	7.75
SparrowsPoint,Md. B2	7.10
Warren,O. R2	7.00
Weirton,W.Va. W6	7.00
Yorkville,O. W10	7.00

HOLLOWARE ENAMELING Black Plate (29 Gage)

Dravosburgh,Pa. U5	6.65
Gary,Ind. U5	6.65
GraniteCity,Ill. G4	6.75
Ind.Harbor,Ind. Y1	6.65
Yorkville,O. W10	6.65

MANUFACTURING TERNES (Special Coated; Base Box)

Dravosburg,Pa. U5	$8.70
Gary,Ind. U5	8.70
Yorkville,O. W10	8.70

MANUFACTURING TERNES (Light Coated, 6 lb; Base Box)

Yorkville,O. W10	$9.15

ROOFING SHORT TERNES (8lb Coated; Base Box)

Gary,Ind. U5	$10.25

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	6.60
Aliquippa,Pa. J5	6.60
Alton,Ill.L1	6.775
Atlanta A11	6.80
Bartonville,Ill. K4	6.70
Buffalo W12	6.60
Chicago W13	6.60
Cleveland A7	6.60
Crawfordsville,Ind. M8	6.70
Donora,Pa. A7	6.60
Duluth,Minn. A7	6.60
Fairfield,Ala. T2	6.60
Fostoria,O. (24) S1	6.80
Houston S5	6.85
Jacksonville,Fla. M8	6.95
Johnstown,Pa. B2	6.60
Joliet,Ill. A7	6.60
KansasCity,Mo. S5	6.85
Kokomo,Ind. C16	6.70
LosAngeles B3	7.55
Minnequa,Colo. C10	6.85
Monessen,Pa. P7	6.60
Newark 6-8 ga. I-1	6.90
N.Tonawanda B11	6.60
Palmer,Mass. W12	6.90
Pittsburg,Calif. C11	7.20
Portsmouth,O. P12	6.60
Rankin,Pa. A7	6.60
S.Chicago,Ill. R2	6.60
S.SanFrancisco C10	7.55
SparrowsPoint,Md. B2	6.70
Sterling,Ill.(1) N15	6.60
Sterling,Ill. N15	6.70
Struthers,O. Y1	6.60
Waukegan,Ill. A7	6.60
Worcester,Mass. A7	6.90

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	7.90
Alton,Ill. L1	8.075
Bartonville,Ill. K4	8.00
Buffalo W12	7.90
Cleveland A7	7.90
Donora,Pa. A7	7.90
Duluth,Minn. A7	7.90
Fostoria,O. S1	7.95
Johnstown,Pa. B2	7.90
LosAngeles B3	8.85
Milbury,Mass.(12) N6	8.20
Minnequa,Colo. C10	8.15
Monessen,Pa. P16	7.90
Muncie,Ind. I-7	8.10
Palmer,Mass. W12	8.20
Pittsburg,Calif. C11	8.85
Portsmouth,O. P12	7.90
Roebling,N.J. R5	8.20
S.Chicago,Ill. R2	7.90
S.SanFrancisco C10	8.85
SparrowsPt.,Md. B2	8.20
Struthers,O. Y1	7.90
Trenton,N.J. A7	8.20
Waukegan,Ill. A7	7.90
Worcester A7,J4,T6,W12	8.20

WIRE, Upholstery Spring

Aliquippa,Pa. J5	7.60
Alton,Ill. L1	7.775
Buffalo W12	7.60
Cleveland A7	7.60
Donora,Pa. A7	7.60
Duluth,Minn. A7	7.60
Johnstown,Pa. B2	7.60
KansasCity,Mo. S5	7.85
LosAngeles B3	8.55
Minnequa,Colo. C10	7.775
Monessen,Pa. P16	7.60
NewHaven,Conn. A7	7.90
PalmerMass. W12	7.90
Pittsburg,Calif. C11	8.55
Portsmouth,O. P12	7.60
Roebling,N.J. R5	7.90
S.Chicago,Ill. R2	7.60
S.SanFrancisco C10	8.55
SparrowsPoint,Md. B2	7.70
Struthers,O. Y1	7.60
Trenton,N.J. A7	7.90
Waukegan,Ill. A7	7.60
Worcester,Mass. A7	7.90

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1	12.725
Bartonville,Ill. K4	12.65
Buffalo W12	12.55
Chicago W13	12.55
Cleveland A7	12.55
Crawfordsville,Ind. M8	12.65
Fostoria,O. S1	12.55
Jacksonville,Fla. M8	12.90
Johnstown,Pa. B2	12.55
Kokomo,Ind. C16	12.55
Minnequa,Colo. C10	12.30
Monessen,Pa. P6	12.55
Muncie,Ind. I-7	12.75
Palmer,Mass. W12	12.85
Roebling,N.J. R5	12.85
S.SanFrancisco C10	12.90
Waukegan,Ill. A7	12.55
Worcester,Mass. A7,T6	12.85

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	10.70
Buffalo W12	10.70
Johnstown,Pa. B2	10.70
Minnequa,Colo. C10	10.825
Monessen,Pa. P16	10.70
Muncie,Ind. I-7	10.90
Palmer,Mass. W12	11.00
Pittsburg,Calif. C11	11.50
Portsmouth,O. P12	10.70
Roebling,N.J. R5	11.00
SparrowsPt.,Md. B2	10.80
Struthers,O. Y1	10.70

ROPE WIRE	(A)
Bartonville,Ill. K4	10.55
Buffalo W12	10.55
Fostoria,O. S1	10.55
Johnstown,Pa. B2	10.55
Monessen,Pa. P16	10.55
Muncie,Ind. I-7	10.75
Palmer,Mass. W12	10.85
Portsmouth,O. P12	10.55
Roebling,N.J. R5	10.85
SparrowsPt. B2	10.65
Struthers,O. Y1	10.55
Worcester,Mass. J4	10.85

(A) Plow and Mild Plow; add 0.25c for Improved Plow.

WIRE
(Continued)

WIRE, Tire Bead

Bartonville,Ill. K4	....14.15
Monessen,Pa. P16	....14.20
Roebling,N.J. R5	....14.35

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	....9.50
Baltimore T6	....9.80
Boston T6	....9.80
Buffalo W12	....9.50
Cleveland A7	....9.50
Crawfordsville,Ind. M8	..9.00
Dover,O. G6	....9.50
Fostoria,O. S1	....9.50
FranklinPark,Ill. T6	...9.60
Kokomo,Ind. C16	....9.50
Massillon,O. R8	....9.50
Milwaukee C23	....9.70
Monessen,Pa. P16	*....9.50*
Pawtucket,R.I. N8	....9.80
Riverdale,Ill. A1	....9.60
Rome,N.Y. R6	.... 9.50
Trenton,N.J. R5	....9.80
Worcester A7, T6, W12	9.80

NAIL, Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	...152
Aliquippa,Pa. J5	152
Atlanta A11	154
Bartonville,Ill. K4	154
Chicago,Ill. W13	152
Cleveland A9	157
Crawfordsville,Ind. M8	..154
Donora,Pa. A7	152
Duluth,Minn. A7	152
Fairfield,Ala. T2	152
Galveston,Tex. D7	157
Houston,Tex. S5	157
Jack'ville,Fla.(23) M8	..162
Johnstown,Pa. B2	152
Joliet,Ill. A7	152
KansasCity,Mo. S5	157
Kokomo,Ind. C16	154
Minnequa,Colo. C10	157
Monessen,Pa. P7	152
Pittsburg,Calif. C11	171
Rankin,Pa. A7	152
S.Chicago,Ill. R2	152
SparrowsPt.,Md. B2	154
Sterling,Ill.(1) N15	152
Worcester,Mass. A7	158

NAILS, CUT (100 lb keg)

To Dealers (33)	
Conshohocken,Pa. A3	..$9.05
Wheeling,W.Va. W10	...9.05

STAPLES, Polished Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	...152
Aliquippa,Pa. J5	152
Atlanta A11	154
Bartonville,Ill. K4	154
Crawfordsville,Ind. M8	..154
Donora,Pa. A7	152
Duluth,Minn. A7	152
Fairfield,Ala. T2	152
Jack'ville,Fla.(23) M8	..162
Johnstown,Pa. B2	152
Joliet,Ill. A7	152
Kokomo,Ind. C16	154
Minnequa,Colo. C10	157
Monessen,Pa. P7	152
Pittsburg,Calif. C11	171
Rankin,Pa. A7	152
S.Chicago,Ill. R2	152
SparrowsPt.,Md. B2	154
Sterling,Ill. (1) N15	152
Worcester,Mass. A7	158

TIE WIRE, Automatic Baler (14½ Ga.) (Per 97 lb Net Box)

Coil No. 3150	
AlabamaCity,Ala. R2	..$9.45
Bartonville,Ill. K4	....9.45
Buffalo W12	....9.45
Crawfordsville,Ind. M8	..9.45
Donora,Pa. A7	....9.45
Duluth,Minn. A7	....9.45
Jacksonville,Fla. M8	....9.88
Johnstown,Pa. B2	....9.45
Joliet,Ill. A7	....9.45
Kokomo,Ind. C16	....9.45
LosAngeles B3	....10.24
Minnequa,Colo. C10	....9.60
Pittsburg,Calif. C11	...10.23
S.Chicago,Ill. R2	....9.45
SparrowsPt.,Md. B2	....9.55
Sterling,Ill. N15	....9.35

Coil No. 6500 Stand.	
AlabamaCity,Ala. R2	..$9.75
Bartonville,Ill. K4	....9.75
Buffalo W12	....9.75
Crawfordsville,Ind. M8	..9.75
Donora,Pa. A7	....9.75
Duluth,Minn. A7	....9.75
Jacksonville,Fla. M8	...10.18
Johnstown,Pa. B3	....9.75
Joliet,Ill. A7	....9.75
Kokomo,Ind. C16	....9.75
LosAngeles B3	....10.65
Minnequa,Colo. C10	....9.90
Pittsburg,Calif. C11	...10.55
S.Chicago,Ill. R2	....9.75
SparrowsPt.,Md. B2	....9.85
Sterling,Ill. N15	....9.65

Coil No. 6500 Interim	
AlabamaCity,Ala. R2	..$9.80
Bartonville,Ill. K4	....9.80
Buffalo W12	....9.80
Crawfordsville,Ind. M8	..9.80
Donora,Pa. A7	....9.80
Duluth,Minn. A7	....9.80
Jacksonville,Fla. M8	..10.23
Johnstown,Pa. B2	....9.80
Joliet,Ill. A7	....9.80
Kokomo,Ind. C16	....9.80
LosAngeles B3	....10.60
Minnequa,Colo. C10	....9.95
Pittsburg,Calif. C11	...10.60
S.Chicago, Ill. R2	....9.80
SparrowsPt.,Md. B2	....9.90
Sterling,Ill. N15	....9.70

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	..175**
Aliquippa,Pa. J5	....172‡
Atlanta A11	181
Bartonville,Ill. K4	181
Crawfordsville,Ind. M8	..181
Donora,Pa. A7	....175†
Duluth,Minn. A7	....175†
Fairfield,Ala. T2	....175†
Houston,Tex. S5	....180**
Jacksonville,Fla. M8	186
Johnstown,Pa. B2	....179*
Joliet,Ill. A7	....175†
KansasCity,Mo. S5	....180**
Kokomo,Ind. C16	....177†
Minnequa,Colo. C10	....180**
Monessen,Pa. P7	....178††
Pittsburg,Calif. C11	....195†
Rankin,Pa. A7	....175†
S.Chicago,Ill. R2	....175**
S.SanFrancisco C10	....195**
SparrowsPoint,Md. B2	..181*
Sterling,Ill.(1) N15	...179††

WOVEN FENCE, 9-15 ga.

	Col.
Ala.City,Ala. R2	....162**
Ala.City, 17 ga. R2	....257**
Aliq'ppa,Pa.9-14½ga J5	185‡
Atlanta A11	168
Bartonville,Ill. K4	168
Crawfordsville,Ind. M8	..168
Donora,Pa. A7	....162†
Duluth,Minn. A7	....162†
Fairfield,Ala. T2	....162†
Houston,Tex. S5	....167**
Jacksonville,Fla. M8	173
Johnstown,Pa.(43) B2	...166
Joliet,Ill. A7	....162†
KansasCity,Mo. S5	....167**
Kokomo,Ind. C16	....164†
Minnequa,Colo. C10	....167**
Monessen,Pa. 9 ga. P17	166††
Pittsburg,Calif. C11	....185†
Rankin,Pa. A7	....162†
S.Chicago,Ill. R2	....162**
Sterling,Ill.(1) N15	....166††

WIRE (16 Gage)

	An'id Galv.	Stone
Ala.City R2	...14.50	16.05**
Bartonville K4	..14.50	16.55
Buffalo W12	....14.50	....
Cleveland A7	....14.50	....
Crawf'dsville M8	14.60	16.55
Fostoria,O. S1	..14.60	16.15†
Jacksonville M8	..14.85	16.80
Johnstown B2	..14.50	16.40*
Kokomo C16	...14.60	16.15†
Minnequa C10	..14.75	16.45**
Palmer,MassW12	14.50	16.05*
Pitts.,Calif. C11	14.85	16.40†
S.Chicago R2	..14.50	16.05**
SparrowsPt. B2	..14.60	16.50*
Sterling(1) N15	14.50	16.45††
Waukegan A7	..14.50	16.05
Worcester A7	...14.80	....

WIRE, Merchant Quality

(6 to 8 gage)	An'id	Galv.
Ala.City,Ala. R2	.7.50	7.90**
Aliquippa J5	....7.40	7.925‡
Atlanta A11	....7.60	8.20
Bartonville(48) K4	7.60	8.20
Buffalo W12	.....7.50	7.90†
Cleveland A7	.....7.50	....
Crawfordsville M8	7.50	8.10
Donora,Pa. A7	...7.50	7.90†
Duluth,Minn. A7	..7.50	7.90†
Fairfield T2	.....7.50	7.90†
Houston(48) S5	..7.65	8.05**
Jack'ville,Fla. M8	7.75	8.35
Johnstown B2(48)	7.50	8.10*
Joliet,Ill. A7	.....7.50	7.90†
Kans.City(48) S5	7.65	8.05**
Kokomo C16	.....7.50	7.90†
LosAngeles B3	...8.45	9.05*
Minnequa C10	..7.65	8.05**
Monessen P7(48)	7.40	8.00††
Palmer,Mass. W12	7.80	8.20†
Pitts.,Calif. C11	8.45	8.85†
Portsmouth,O. P12	7.50	....
Rankin A7	.....7.50	7.90†
S.Chicago R2	....7.50	7.90**
S.SanFran. C10	..8.35	8.75**
Spar'wsPt. B2(48)	7.60	8.20*
Str'ling(1)(48)N15	7.40	8.00††
Struthers,O.(48)Y1	7.40	7.90‡
Worcester,Mass.A7	7.80	8.20†

Based on zinc price of: *13.50c. †5c. §10c. ‡Less than 10c. ††13c. **Subject to zinc equalization extras.

FASTENERS

(Base discounts, full case quantity, per cent off list to consumer, f.o.b. mill)

Carriage, Machine Bolts

Full-Size Body (cut thread)
- †½" x 6" and smaller 61
- Larger than ½" diam. and all diams. longer than 6" 55

Under-Size Body (rolled thread; not nutted):
- ½" x 6" and smaller. 61

†½" x 4" and smaller and shorter are not nutted.

NUTS

Reg. & Heavy Square Nuts:
- All sizes 61

H. P. Reg. & Heavy Hex

Nuts:
- ¾" & smaller 64
- ⅞" to 1¼" incl. 63
- 1⅛" to 1½" incl. 65
- 1⅝" & larger 61

C.P. Reg. & Heavy Hex Nuts
- ¾" & smaller 64
- ⅞" & larger 61

Semifinished & Finished Nuts
- ¾" & smaller 66
- ⅞" & larger 63

Semifinished Slotted Reg. & Heavy Hex Nuts
- ¾" & smaller 66
- ⅞" & larger 63

Hot Galvanized Nuts, all types
- 1½" & smaller 44

(On above items, add 25% for less than case quantities)

CAP SCREWS

(New Std., hexagon head, upset, packages)

Bright:

6" and shorter:
- ¼" through ½" diam. 34
- ⅝" & ⅝" diam. 31
- ¾", ⅞", 1" 8

Longer than 6":
- ¼" through ⅝" diam. 3
- ¾" through 1" diam. +13

High Carbon, Heat-treated:

6" and shorter:
- ¼" through ½" diam. 20
- ⅝" & ⅝" diam. 16
- ¾", ⅞", 1" +11

Longer than 6":
- ¼" through ⅝" diam. +23
- ¾" through 1" diam. +41

(New Std. Hexagon head, upset, bulk)

Bright:
- ½" x 6" & smaller & shorter 49
- ⅞", ½", ⅝" diam. x 6" & shorter 48
- ¾", ⅞", 1" x 6" & shorter 31

High Carbon, Heat-treated:
- ½" x 6" & smaller & shorter 41
- ⅞" x ⅝" diam. & 6" & shorter 39
- ¾", ⅞", 1" x 6" & shorter 20

MACHINE SCREW NUTS & STOVE BOLT NUTS (Bulk)
- No. 2 to ⅜" incl., Square: 25,000 to 199,999 pieces 20; 200,000 or more pieces 27
- No. 2 to ⅜" incl., Hex.: 25,000 to 199,999 pieces 18; 200,000 or more pieces 25

MACHINE SCREWS, SLOTTED (Bulk)
- No. 2 to ¼" diam. incl.: 25,000 to 199,999 pieces 20; 200,000 or more pieces 27
- ⅝" to ½" diam. incl.: 15,000 to 99,999 pieces 20; 100,000 or more 27

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	21.06	20.42
1¼	13	....	24.94	20.45
1½	13	23.31	27.57	22.61
1¾	13	27.54	32.57	26.71
2	13	30.87	36.51	29.93
2¼	13	34.77	41.12	33.72
2½	12	37.73	44.63	36.60
2¾	12	41.57	49.16	40.31
2¾	12	45.00	53.22	43.65
3	12	47.99	56.76	46.55

RAILWAY MATERIALS

	Standard No. 1	Standard No. 2	Standard All	Tee Rails 60 lb Under
RAILS				
Bessemer,Pa. U5	4.725	4.625	4.675	5.65
Ensley,Ala. T2	4.725	4.625	....	5.65
Fairfield,Ala. T2	....	....	....	5.65
Gary,Ind. U5	4.725	4.625	4.675	....
Huntington,W.Va. W7	....	....	....	5.65
IndianaHarbor,Ind. I-2	4.725	4.625	4.675	....
Johnstown,Pa. B2	....	....	...(16)	5.65
Lackawanna,N.Y. B2	4.725	4.625	...(16)	5.65
Minnequa,Colo. C10	4.725	4.625	....	6.15
Steelton,Pa. B2	4.725	4.625	....	....
Williamsport,Pa. S19	....	....	....	5.65

TIE PLATES

Fairfield,Ala. T2	.....5.625
Gary,Ind. U5	.....5.625
Ind.Harbor,Ind. I-2	.....5.625
Lackawanna,N.Y. B2	...5.625
Minnequa,Colo. C10	...5.625
Seattle B3	.....5.775
Steelton,Pa. B2	.....5.625
Torrance,Calif. C11	...5.775

TRACK BOLTS, Untreated

Cleveland R2	.....12.15
KansasCity,Mo. S5	....12.90*
Lebanon,Pa. B2	.....12.15
Minnequa,Colo. C10	...12.15
Pittsburgh O3, P14	...12.15
Seattle B3	.....12.65

*Treated

AXLES

Ind.Harbor,Ind. S13	...7.50
Johnstown,Pa. B2	.....7.50

JOINT BARS

Bessemer,Pa. U5	.....5.825
Fairfield,Ala. T2	.....5.825
Ind.Harbor,Ind. I-2	...5.825
Joliet,Ill. U5	.....5.825
Lackawanna,N.Y. B2	...5.825
Minnequa,Colo. C10	...5.825
Steelton,Pa. B2	.....5.825

SCREW SPIKES

Cleveland R2	.....11.90
Pittsburgh O3	.....11.90

STANDARD TRACK SPIKES

Fairfield,Ala. T2	.....8.05
Ind.Harbor,Ind. I-2, Y1	7.90
KansasCity,Mo. S5	.....7.90
Lebanon,Pa. B2	.....8.05
Minnequa,Colo. C10	....7.90
Pittsburgh J5	.....8.05
Seattle B3	.....8.55
S.Chicago,Ill. R2	.....8.05
Struthers,O. Y1	.....7.90
Youngstown R2	.....8.05

METAL POWDER

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge iron: 98+% Fe, annealed.	9.25
Swedish, c.i.f., Camden, N. J., c.l. in bags..	9.50
Domestic: F.o.b., Johnstown, Pa., Niagara Falls, N.Y., in bags	9.50
F.o.b. Riverton, N. J., in bags....	8.50
Canadian, f.o.b. shipping point	9.50
Electrolytic iron: Melting stock, 99.9% Fe, irregular fragments of ⅛ in. x 1.3 in.	22.00
Annealed, 99.5% Fe.	36.50
Unannealed (99+% Fe)	34.00
Unannealed (99+% Fe) (minus 325 mesh)	57.00
Powder Flakes (minus 16, plus 100 mesh)..	31.00
Carbonyl Iron: 98.1-99.9%, 3 to 20 microns, depending on grade, 86.00-275.00, in standard 200-lb containers; all minus 200 mesh.	
Aluminum: Atomized, 500 lb, drum frght. allowed Carlots	34.50
Ton lots	36.50
Antimony, 500 lb lots	32.00*
Brass, 5000-lb lots	41.75-65.25†
Bronze, 5000-lb lots	67.50-71.75†
Copper: Electrolytic	14.25*
Reduced	14.25*
Lead	7.50*
Manganese: Minus 35 mesh	64.00
Minus 100 mesh	70.00
Minus 200 mesh	75.00
Nickel, unannealed	$1.00
Nickel-Silver, 5000-lb lots	62.75-65.25†
Phosphor-Copper, 5000-lb lots	68.75
Silicon	47.50
Solder	7.00*
Stainless Steel, 302 ..	99.00
Stainless Steel, 316 ..	$1.32
Tin	14.50*
Zinc 5000-lb lots	19.25-33.00‡
Tungsten Melting grade, 99% 60 to 200 mesh: 1000 lb and over...	Dollars 4.50
Less than 1000 lb..	4.65
Chromium, electrolytic 99.8% Cr min. metallic basis	5.00

*Plus cost of metal. †Depending on composition. ‡Depending on mesh. §70% Cu, 20% Zn, 10% Ni. **64% Cu, 18% Zn, 18% Ni.

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1¼-in. to less than 1 7/16-in.
(6) Chicago or Birm. base.
(7) To jobbers, 3 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(21) New Haven, Conn., base.
(22) Deld. San Francisco Bay area.
(23) Plus 4c per 100 lb.
(24) Deduct 0.10c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.25c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝-in.; 6.90c for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) 13 Ga. & heavier; 60" & narrower.
(38) 14 Ga. & Lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.25c.
(43) 9-14½ Ga.
(48) 6-7 Ga.
(49) 3½-in. and smaller rounds; 7.95c over 3½-in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25
Ambridge, Pa. N2	6.5	...	10.5	....	13	....	14.5	....	14.5	....	14	....	16.5	....
Lorain, O. N3	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25
Youngstown Y1	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown Y2	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Alton, Ill. L1	....	....	....	....	....	....	16.5	+2.75	19.5	1.25	22	4.75	24.5	6.5
Benwood, W. Va. W10	17.5	+13	9	+18.5	+0.75	+28.5	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Butler, Pa. F6	18	+12.5	9.5	+18	1.5	+26	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Fairless, Pa. N3	....	....	....	....	....	....	16.5	+2.75	19.5	1.25	22	4.75	24.5	6.5
Fontana, Calif. K1	....	....	....	....	....	....	6	+13.25	9	+9.25	11.5	+5.75	14	+4
Ind. Harbor, Ind. Y1	....	....	....	....	....	....	17.5	+1.75	20.5	2.25	23	5.75	25.5	7.5
Lorain, O. N3	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Sharon, Pa. S4	18	+12.5	9.5	+18	1.5	+26	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Sparrows Pt., Md. B2	16	+12.5	7.5	+18	+0.5	+25	16.5	+0.75	19.5	3.25	22	6.75	24.5	8
Youngstown R2, Y1	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Wheatland, Pa. W9	18	+12.5	9.5	+18	1.5	+26	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Alton, Ill. L1	25	7.5	25.5	8	27	8.75	27	8.75	....	....	....	....
Benwood, W. Va. W10	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Etna, Pa. N2	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Fairless, Pa. N3	25	7.5	25.5	8	27	8.75	27	8.75	17.5	+1.25	17.5	+1.25
Fontana, Calif. K1	14.5	+3	15	+2.5	16.5	+1.75	16.5	+1.75	7	+11.75	7	+11.75
Ind. Harbor, Ind. Y1	26	8.5	26.5	9	28	9.75	28	9.75	18.5	+0.25	18.5	+0.25
Lorain, O. N3	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Sharon, Pa. M6	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Sparrows Pt., Md. B2	25	9	25.5	9.5	27	9.75	27	9.75	17.5	+0.25	17.5	+0.25
Wheatland, Pa. W9	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Youngstown R2, Y1	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75

*Galvanized pipe discounts based on current price of zinc (13.50c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	Rerolling Ingot	Rerolling Slabs	Forging Billets	Seamless Tube Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	18.50	23.00	....	....	31.00	....	....	....	42.25	39.00
202	19.75	25.50	31.00	36.25	33.50	....	36.75	38.75	42.50	42.50
301	19.25	23.75	....	36.75	32.00	36.00	38.00	....	44.25	41.00
302	20.50	26.25	32.00	37.25	34.50	36.25	38.25	40.25	44.50	44.50
302B	20.25	26.50	33.00	37.25	37.75	36.25	38.25	40.25	47.00	47.00
303	....	26.75	34.75	40.00	....	39.00	41.00	....	....	....
304	21.75	27.50	33.75	39.00	37.25	38.25	40.25	43.00	47.25	47.25
304L	....	....	38.75	44.00	42.25	43.25	45.25	48.00	52.25	52.25
305	23.25	30.25	....	39.50	40.25	38.25	40.25	43.50	50.25	50.25
308	23.50	30.50	38.50	44.25	41.25	43.25	45.50	49.75	52.00	52.00
309	31.00	39.75	46.75	53.50	53.50	52.00	54.75	58.25	67.00	67.00
310	37.25	48.00	62.25	72.25	68.50	69.75	73.50	75.25	78.75	78.75
314	....	....	....	....	....	69.75	....	75.25	....	....
316	31.50	40.25	51.25	59.50	58.25	57.75	60.75	64.00	68.25	68.25
316L	....	....	56.25	64.50	63.25	62.75	65.75	69.00	73.25	73.25
317	37.25	48.25	62.75	72.75	75.50	70.75	74.50	77.00	83.75	83.75
321	25.00	32.00	38.25	44.00	44.25	43.00	45.25	49.25	54.25	54.25
18-8CcTa	29.25	38.00	45.75	52.25	53.25	50.75	53.50	58.00	66.50	66.50
403	....	....	28.75	32.75	....	32.25	34.00	36.25	....	....
405	17.50	23.00	26.75	31.00	32.25	30.50	32.00	33.75	42.25	42.25
410	15.00	19.50	25.50	29.50	28.00	29.00	30.50	31.75	36.25	36.25
416	....	....	26.00	30.00	....	29.50	31.00	....	....	....
420	....	30.25	31.00	36.00	37.75	35.50	37.25	40.75	56.00	56.00
430	15.25	19.75	26.00	30.00	28.75	29.50	31.00	32.25	34.50	36.75
430F	....	....	26.50	30.50	....	30.00	31.50	....	....	....
431	....	25.50	33.25	....	....	37.25	39.25	40.75	....	....
446	....	....	35.50	40.50	53.25	40.00	42.00	43.25	63.25	63.25

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U. S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Carpenter Steel Co.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Ellwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McLouth Steel Corp.; Metal Forming Corp.; McInnes Steel Co.; National-Standard Co.; National Tube Div., U. S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Tube Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Rotary Electric Steel Co.; Sharon Steel Corp.; Sawhill Tubular Products Inc.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Superior Steel Corp., Superior Tube Co.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

	Plates: Carbon Base 10%	Plates: Carbon Base 20%	Sheets Carbon Base 20%
302	....	....	30.50
304	30.30	36.05	32.50
304-L	32.30	37.95	....
310	41.30	47.00	....
316	35.50	41.40	47.00
316-L	40.00	46.10	....
316-CB	41.15	48.45	....
321	32.00	37.75	37.25
347	34.40	41.40	48.25
405	25.80	33.35	....
410	25.30	32.85	....
430	25.30	32.85	....
Inconel	49.45	65.45	....
Nickel	41.05	55.65	....
Nickel, Low Carbon	43.25	60.05	....
Monel	42.35	56.35	....
Copper*	....	....	46.00

	Strip, Carbon Base, Cold Rolled: 10%	Strip, Carbon Base, Cold Rolled: Both Sides
Copper*	32.75	41.25

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4 and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.275	5% Cr Hot Work	0.430-0.460
Extra Carbon	0.330	W-Cr Hot Work	0.450
Special Carbon	0.390	V-Cr Hot Work	0.470
Oil Hardening	0.430	Hi-Carbon-Cr	0.770

Grade by Analysis (%) W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	...	4.090
18.25	4.25	1	4.75	....	2.305-2.475
18	4	2	9	....	2.675-2.6775
18	4	2	....	....	1.765
18	4	1	....	....	1.600
13.75	3.75	2	5	....	2.245
13.5	4	3	....	....	1.865
9	3.5	..	....	....	1.180
6	4	2	....	5	1.105
6	4	3	....	6	1.350
1.5	4	1	....	8.5	0.960

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, D4, F2, J3, M14, S8, U4, V2 and V3.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal tax.

Birmingham District	Basic	No. 2 Foundry	Malleable	Bessemer
AlabamaCity,Ala. R2	54.50	....	....	....
Birmingham R2	54.50	55.00‡	....	....
Birmingham U6	....	55.00‡	59.00	....
Woodward,Ala. W15	54.50	55.00‡	59.00	....
Cincinnati, deld.	....	62.70	....	....
Buffalo District				
Buffalo H1, R2	60.00	60.50	61.00	61.50
Tonawanda,N.Y. W12	60.00	60.50	61.00	61.50
N.Tonawanda,N.Y. T9	....	60.50	61.00	61.50
Boston, deld.	70.65	71.15	71.65	....
Rochester,N.Y. deld.	63.02	63.52	64.02	....
Syracuse,N.Y. deld.	64.12	64.62	65.12	....
Chicago District				
Chicago I-3	60.00	60.50	60.50	61.00
Gary,Ind. U5	60.00	....	60.50	....
S.Chicago R2	60.00	....	60.50	....
S.Chicago,Ill. Y1	60.00	60.50	60.50	61.00
S.Chicago,Ill. U5, W14	60.00	....	60.50	61.00
Milwaukee, deld.	62.30	62.80	62.80	63.30
Muskegon,Mich. deld.	....	67.18	67.18	....
Cleveland District				
Cleveland R2, A7	60.00	60.50	60.50	61.00
Akron,O. deld.	62.75	63.25	63.25	63.75
Mid-Atlantic District				
Bethlehem,Pa. B2	62.00	62.50	63.00	63.50
NewYork, deld.	....	66.51	67.01	....
Newark, deld.	65.20	65.70	66.20	66.70
Birdsboro,Pa. B10	62.00	62.50	63.00	63.50
Chester,Pa. P14	62.00	62.50	63.00	....
Philadelphia, deld.	63.76	64.26	64.76	....
Steelton,Pa. B2	62.00	62.50	63.00	63.50
Swedeland,Pa. A3	62.00	62.50	63.00	63.50
Philadelphia, deld.	63.76	64.26	64.76	65.26
Troy,N.Y. R2	62.00	62.50	63.00	63.50
Pittsburgh District				
NevilleIsland,Pa. P6	60.00	60.50	60.50	....
Pittsburgh (N&S sides), Aliquippa, deld.	....	61.95	61.95	62.48
McKeesRock, deld.	....	61.60	61.60	62.13
Lawrenceville,Homestead, Wilmerding,Monaca, deld.	....	....	62.26	62.26	62.79
Verona,Trafford, deld.	62.29	62.82	62.82	63.35
Brackenridge, deld.	62.60	63.10	63.10	63.63
Bessemer,Pa. U5	60.00	....	60.50	61.00
Clairton,Rankin,S.Duquesne,Pa. U5	60.00	....	....	....
Midland,Pa. C18	58.50	....	....	....

Youngstown District	Basic	No. 2 Foundry	Malleable	Bessemer
Hubbard,O. Y1	....	....	60.50	....
Sharpsville,Pa. S6	60.00	....	60.50	61.00
Youngstown Y1	....	....	60.50	61.00
Youngstown U5	60.00	....	....	61.00
Mansfield,O. deld.	64.90	....	65.40	65.90
Duluth I-3	60.00	60.50	60.50	61.00
Erie,Pa. I-3	60.00	60.50	60.50	61.00
Everett,Mass. E1	62.00	62.50	63.00	....
Fontana,Calif. K1	67.50	68.00	....	....
Geneva,Utah C11	60.00	60.50	....	....
GraniteCity,Ill. G4	60.40	60.90	61.40	....
Ironton,Utah C11	60.00	60.50	....	....
LoneStar,Texas L6	....	55.00*	....	....
Minnequa,Colo. C10	62.00	62.50	63.00	....
Rockwood,Tenn. T3	....	55.00‡	59.00	....
Toledo,O. I-3	60.00	60.50	60.50	61.00
Cincinnati, deld.	65.76	66.26	....	....

*Phos. 0.51-0.75%; $56, Phos. 0.31-0.50%.
‡Intermediate (Phos. 0.31-0.39%), $56.

PIG IRON DIFFERENTIALS

Silicon: Add 50 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.50% manganese over 1% or portion thereof.

Nickel: Under 0.05% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1.25 for each 0.5% Si; 75 cents for each 0.50% Mn over 1%)

Jackson,O. G2, J1	69.00
Buffalo H1	70.25

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

NiagaraFalls,N.Y. P15	$92.50
Keokuk,Iowa, Open-hearth & Fdry, freight allowed K2)	97.00
Keokuk, O. H. & Fdry, 12½ lb piglets, 16% Si, frgt allowed K2	100.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$72.50
Rockwood,Tenn. T3 (Phos 0.035% max)	72.50
Steelton,Pa. B2 (Phos. 0.035% max)	68.00
Philadelphia, deld.	71.55
Troy,N.Y. R2 Phos. 0.035% max)	68.00
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	65.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	65.00
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	65.00
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	65.00

Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: St. Paul, 25 cents; Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, San Francisco, 10 cents; Atlanta, Houston, Seattle, Spokane, no charge.

	SHEETS				STRIP	BARS				Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Galv. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Merchant Qual.	H.R. Spec. Qual.	C.F. Rds.‡	H.R. Alloy 4140††		Carbon	Floor
Atlanta	7.14	8.20	8.87	....	7.40	7.42	....	9.59	....	7.63	7.49	9.48
Baltimore	7.24	8.35	8.50	....	7.70	7.70	...	8.49[9]	14.39	7.94	7.56	9.02
Birmingham	7.13	8.24	8.85	....	7.21	7.27	7.80	9.35	....	7.43	7.45	9.50
Boston	8.12	9.07	10.32	53.32	8.21	8.21	8.76	9.73	13.56	8.27	8.41	9.84
Buffalo	7.20	8.25	10.01	....	7.35	7.35	8.05	7.90	13.35	7.60	7.65	9.00
Chattanooga	7.28	8.44	8.60	....	7.36	7.42	7.95	9.18	....	7.63	7.60	9.32
Chicago	7.13	8.24	9.10	46.75	7.21	7.27	7.80	7.75	13.05	7.43	7.45	8.72
Cincinnati	7.25	8.23	9.10	46.10	7.45	7.51	8.04	8.15	13.29	7.90	7.74	8.97
Cleveland	7.13	8.24	8.95	49.16	7.31	7.33	7.86	8.00	13.11	7.76	7.62	8.89
Denver	8.95	10.31	11.73	....	9.10	9.10	...	9.82	17.87	8.95	9.10	10.50
Detroit	7.32	8.43	9.38	43.50	7.49	7.55	8.08	8.04	13.25	7.90	7.73	8.91
Erie, Pa.	7.08	8.24	8.95[10]	....	7.31	7.35	...	8.10[10]	....	7.65	7.30	8.79
Houston	7.85	8.75	10.49	....	8.15	8.25	..	9.85	14.00	8.20	7.80	9.20
Jackson, Miss.	7.46	8.52	9.22	....	7.44	7.59	8.12	9.44	....	7.75	7.77	9.44
Los Angeles	8.15	10.00	11.00	51.50	8.50	8.15	8.70	10.90	14.35	8.30	8.75	10.85
Milwaukee	7.22	8.33	9.19	....	7.30	7.36	7.89	7.94	13.14	7.60	7.54	8.81
Moline, Ill.	7.15	8.44	8.85	....	7.41	7.43	...	8.10	....	7.63	7.34	...
New York	7.78	8.88	9.63	53.13	8.23	8.16	8.71	9.77	13.47	8.11	8.21	9.50
Norfolk, Va.	7.35	...	...	....	7.80	7.85	...	9.95	....	8.10	7.60	9.10
Philadelphia	7.34	8.44	9.41	45.98	7.99	7.73	8.26	8.52	13.25	7.75	7.72	8.83**
Pittsburgh	7.13	8.24	9.40	49.00	7.21	7.27	7.80	8.00	13 05	7.43	7.45	8.72
Portland, Oreg.	7.80	8.80	10.65	....	8.00	7.95	...	12.20	15.00	7.85	7.75	9.60
Richmond, Va.	7.25	...	9.49	....	7.85	7.85	..	9.50	...	8.10	7.50	9.35
St. Louis	7.42	8.53	9.69	43.89	7.50	7.56	8.09	8.29	13.34	7.83	7.74	9.01
St. Paul	7.46	8.59	9.16	....	7.72	7.74	...	8.51	13.51	7.94	7.65	9.12
San Francisco	8.20	9.65	10.15	51.65	8.35	8.15	8.70	11.45	14.35[3]	8.25	8.30	10.50
Seattle	7.85	10.50	10.90	54.00	8.90	8.60	9.15	12.25	14.65	8 50	8.50	10.70
Spokane	8.75	11.10[7]	10.90	....	8.90	8.60	9.15	12.25	15.40	8.50	8.50	11.20
Washington	7.78	9.80	8.60	....	8.49	8.24	...	9.40	....	8.51	8.11	9.56

*Prices do not include gage extras; †prices include gage and coating extras (based on 13.50-cent zinc), except in Birmingham (coating extra excluded); ‡includes 35-cent special bar quality extras; **¼-in. and heavier; ††as annealed; ‡‡under ½-in.

Base quantities: 2000 to 4999 lb except as noted; Cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb, and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb; [2]—500 to 9999 lb; [3]—400 to 999 lb; [4]—4000 lb and over; [5]—1000 to 1999 lb; [6]—1000 lb and over; [7]—1500 to 3999 lb; [8]—2000 to 3999 lb; [9]—f.o.b. local delivery in lots of 10,000 lb and over; [10]—2000 lb and over

USING BERYLLIUM COPPER TO DESIGN A VIBRATION MOUNT THAT HAS A DAMPING EFFICIENCY OF 95%

SOURCE: K. W. Johnson, former chief engineer of the Mechanical Section, Wright Air Development Center, and president of K. W. Johnson & Company, Dayton, Ohio

Objective:

To obtain an all-weather, all-altitude metal mount which will provide maximum damping and stability for electronic instruments in shock conditions up to 30 g, and in-flight vibration conditions through the range of 1-500 cps.

Metal Requirements:

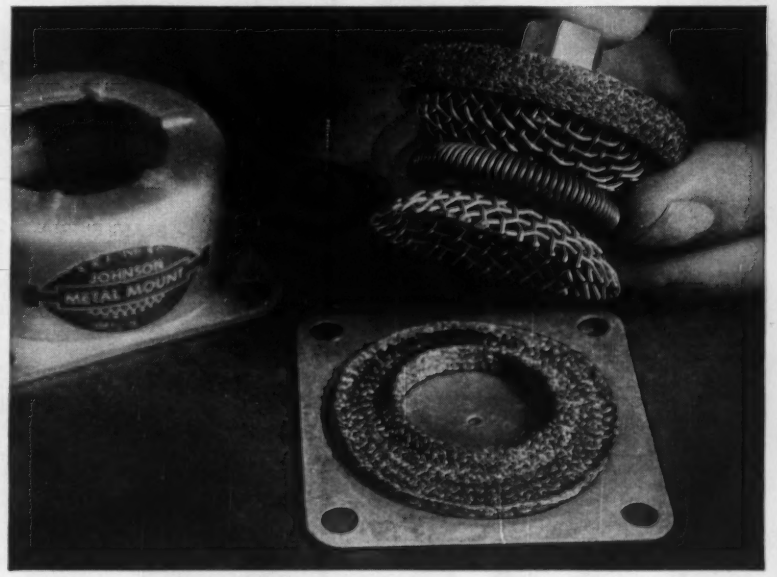
In addition to the stringent load requirements, the metal used must pass test conditions of temperature differentials ranging from —65°C. to +200°C., high salt spray concentrations, extreme humidity, and long storage. It must have excellent fatigue life and metallic compatibility.

Procedure:

A convexed spring is fabricated of beryllium copper wire cloth, formed and cut on a punch press, then heat treated. Two of these discs are fastened together back-to-back with the convex surfaces facing each other. A circular coil spring is fitted around the assembly in the "V" made by the joining of the discs.

The concave-convex beryllium copper assembly absorbs the shock in a vertical and radial pattern. This spring alone would produce a bouncing action, causing the unit to move in uncontrolled prolonged cycling. To regulate this effect, the motion of the beryllium copper spring is resisted by the friction of the coil spring against the convex surface of the concave-convex spring. It cushions the downward action as it expands, and contracts to level the upward surge. The end result is a double damping system where the coil spring moderates the concave-convex system, and, at the same time, is damped by it. Consequently, magnification at resonance is controlled on the order of 1.5.

Forming and cutting the concave-convex spring from "BERYLCO" brand #25 wire cloth.



The mount uses a double reacting spring arrangement—a beryllium copper concave-convex spring and a circular coil spring provide a damping efficiency up to 95%.

Test Results:

In the 50-hour salt test, stainless steel cloth failed completely—the stainless convexed springs could be broken apart and disintegrated by handling. A shift was made to "BERYLCO" #25 beryllium copper alloy to obtain a cloth which had superior spring characteristics over stainless, and gave much greater fatigue life. The beryllium copper spring holds up without failure or setting tendencies, and it is unaffected by a salt atmosphere. It has proven to be over 200% better from a life and service standpoint.

Many metals and alloys cannot be used together in applications of this type because they are inducive to an electrolytic action. Localized corrosion resulting from a coupling of dissimilar metals does not occur in this mount, because beryllium copper is compatible with the other alloys which are used.

Summary

"Beryllium copper is the heart of our vibration control unit," asserts K. W. Johnson, president of the K. W. Johnson Company. "It has given us the qualities of high strength, resistance to temperature extremes and severe shock, increased fatigue life, and eliminated the danger of corrosion. Without it, we could not have passed the service qualification test."

A technical bulletin (#33), with specific details on the design and use of beryllium copper in the Johnson Metal Mounts, is available on request without charge. Write to

THE BERYLLIUM CORPORATION • Reading, Pennsylvania
"BERYLCO" Brand Beryllium Copper Is Shelf-Stocked by Leading Warehouse Distributors
Export Department: Reading, Pennsylvania • Cable Address "BERYLCO"

Checking size accuracy of mechanical tubing at Pittsburgh Steel Co.

Handy Man Turns Specialist

Mechanical tubing finds many functional uses in age of automation. Despite large captive tonnage, tubemakers see an expanding market for this versatile product

MECHANICAL TUBING, the "handy man" of tubular products, is taking on more specialized chores in this age of automation. It's no longer merely a structural part.

As officials of National Tube Division, U. S. Steel Corp., explain: "Use of mechanical tubing in hydraulic cylinders will grow with applications of automatic industrial equipment. There's more equipment in use, and the average unit of equipment uses more welded or seamless mechanical tubing."

Growth Fields—Much of the excitement about new applications concerns automotive transmissions, construction machinery, general industrial equipment and mining machinery. Roadbuilding equipment and agricultural machinery are using more hydraulic cylinders and more tubing for the cylinders.

Here's how salesmen at some of the main producing points summarize the outlook: "Mechanical tubing sales are increasing rapidly for applications in building construction," report officials of Sawhill Tubular Products Inc., Sharon, Pa. "More mechanical tubing is being used per unit of agricultural equipment," reports Republic Steel Corp., Steel & Tubes Division, Cleveland. "More automotive companies are trending toward mechanical tubing for chassis frames," officials say.

Shifting Into High—"More of the new automatic transmissions for cars are being designed around the use of alloy mechanical tubing," report salesmen at Babcock & Wilcox Co.'s Tubular Products Division, Beaver Falls, Pa. With automotive demand for steel slowing slightly in the second quarter, tubemakers expect a renewal of interest when production begins on new models (which should include more automatic transmissions). One auto maker had nine tubular parts in its 1954 transmissions, 24 in its 1955 models and is planning to use more.

Statistics of the American Iron & Steel Institute only suggest the potential size of these new tubing markets. Auto makers fabricate a good portion of the mechanical tubing for their own needs. Despite this captive tonnage, the industry is one of the leading growth markets. AISI statistics show that 61,722 tons were shipped to assemblers of automotive vehicles and parts in 1950. In 1955, shipments were 100,599 tons. "Ten years ago much of this demand was simply unforeseen," a Pittsburgh Steel Co. official points out. The industry has lost other important markets to the captive shop, too. Yet, its total shipments have continued to increase over the years.

Warehouse sales are rising, as mills find it uneconomical to supply the growing tide of low-tonnage orders for small parts. In 1950, warehouses and distributors took 125,853 tons of mechanical tubing, AISI reports. Five years later, 163,996 tons were shipped to distributors.

Stronger Demand—Shipments are

there's no premium for precision

with "Fischer Turned"

BRASS AND ALUMINUM NUTS

Costing no more than nuts produced by other, less accurate methods, Fischer precision-turned brass and aluminum nuts make possible important savings in assembly operations. Check these advantages:

Countersunk on both sides for faster starting . . .

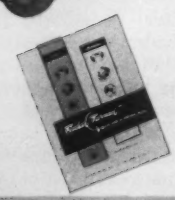
Tapped square with face to Class 2 tolerances for smoother, easier running and superior bearing surfaces . . .

Turned from stock under basic size so they're never tight on wrenches . . .

Tapped through, eliminating "blanks" or rejects . . .

Cleaned and degreased before delivery to save you these operations.

Specify Fischer on your next order. A complete range of standard types and sizes is maintained in stock . . . "specials" can be produced quickly and inexpensively.



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rising to industries using mechanical tubing in hydraulic cylinders. Reports a major tubemaker: "Although unit sales of agricultural equipment are slow in 1956, sales to this industry should increase, because more tubing is being used per unit." Construction and related equipment industries bought 8147 tons in 1950 and 14,363 tons in 1955, AISI figures show.

If the government's proposed road-building program becomes a reality, mechanical tubing will find increased usage in large hydraulic cylinders for heavy machinery builders. Even now there is a definite growth trend in that direction, report sales officials of National Tube. Earthmoving machinery uses considerable mechanical tubing in bushings, tie bars and other parts in addition to hydraulic cylinders.

No More Plants — Tubemakers doubt that new capacity will be required. They point out that over-all mechanical tubing sales rose from 744,000 tons in 1950 to 1.1 million tons in 1953, then declined to 966,000 tons in 1955. Certain markets, such as ordnance and other military groups, have declined in recent years, AISI statistics show. "What's holding us back now is not lack of finishing capacity but shortage of steel," one operating man adds.

Supply Pinch—If auto makers' demand grows sharply, a possible bottleneck may be in heat treating. Tubing for automotive applications requires careful annealing. Despite slowdowns caused by the over-all steel shortage, tubemakers are confident that they can fill strong second quarter demand without delay. Mills generally have full order books for two to three months.

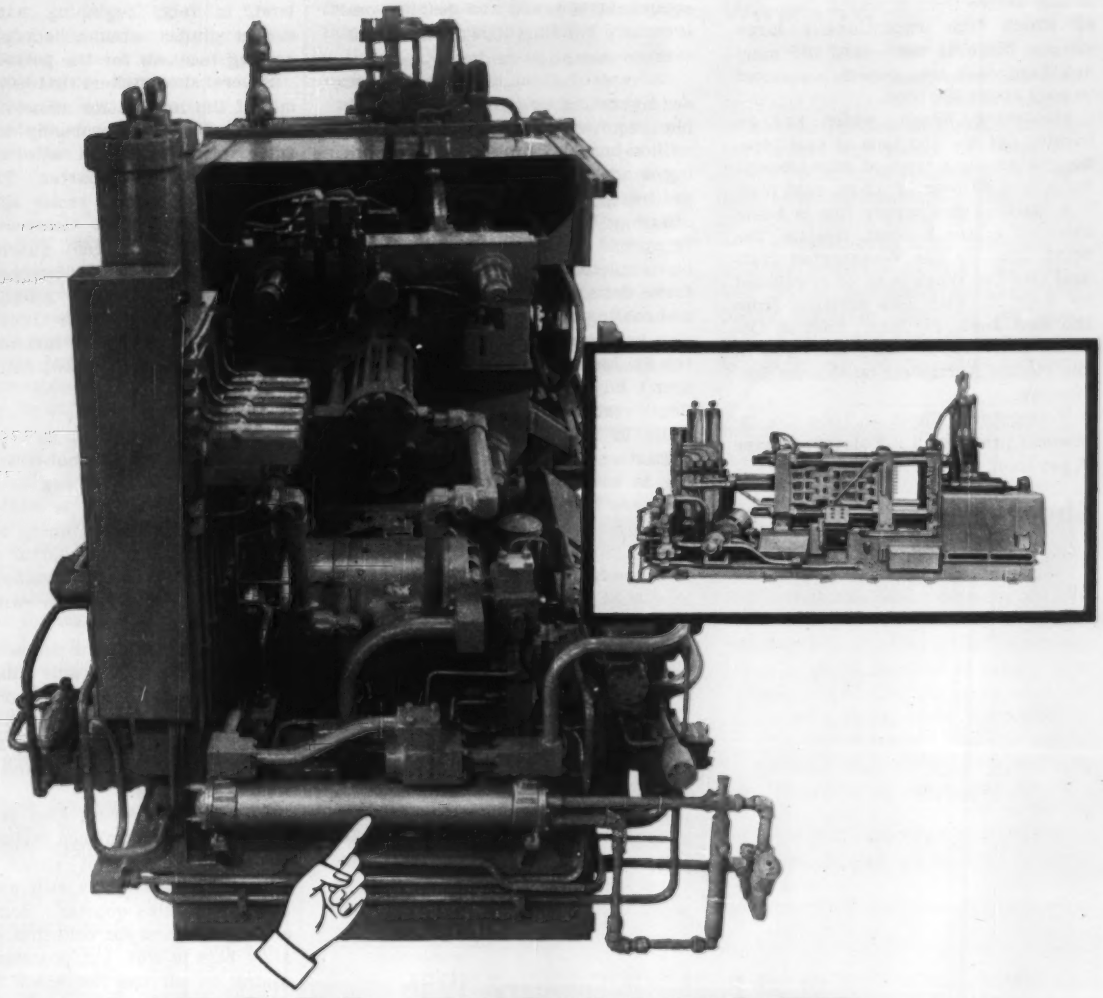
Tubular Goods . . .

Tubular Goods Prices, Page 174

A major producer of pipe in the Pittsburgh area reports it ended March with an exceptionally heavy carry-over of orders for specialty items and oil country tube. To trim backlogs in the second quarter, hot mills will be forced to work at capacity continuously.

Construction is increasing and is being reflected in rising demand for welded tubing. There are growing needs for this product in conveyor equipment, as mills expand their material handling facilities. Miscellaneous equipment uses are also strong, as in water heaters. The only dark spot in the outlook rests on the shortage of steel for tube production.

The cast iron pipe market in the Pacific Northwest last week was reported to have gone into a temporary slump after it had shown signs of a brisk seasonal pickup. Demand



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maintains steady oil temperature

in this new, larger Cleveland Die Caster

Strain gauge tested at 500-ton locking pressure, this new Model 500 Cleveland Die Casting Machine has a 25 lb. maximum shot capacity.

Hydraulic oil, supplied by the 200-gallon reservoir, is kept from overheating and thinning by a Ross Type BCF Exchanger. Power losses, caused by fluctuating oil temperatures, are prevented. Peak performance is assured.

Noted for their high thermal efficiency and extreme ruggedness, Ross Exchangers are specified for numerous types of hydraulic machinery: extrusion and metal drawing presses, die casting machines, powdered metal presses, injection and compression molding machines.

Pre-engineered and fully standardized, they're available in a wide range of sizes.

Bulletin 1.1K5 will give you detailed information. Write to Ross Heat Exchanger Division of American-Standard, 1431 West Avenue, Buffalo 13, N. Y. In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

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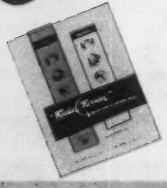

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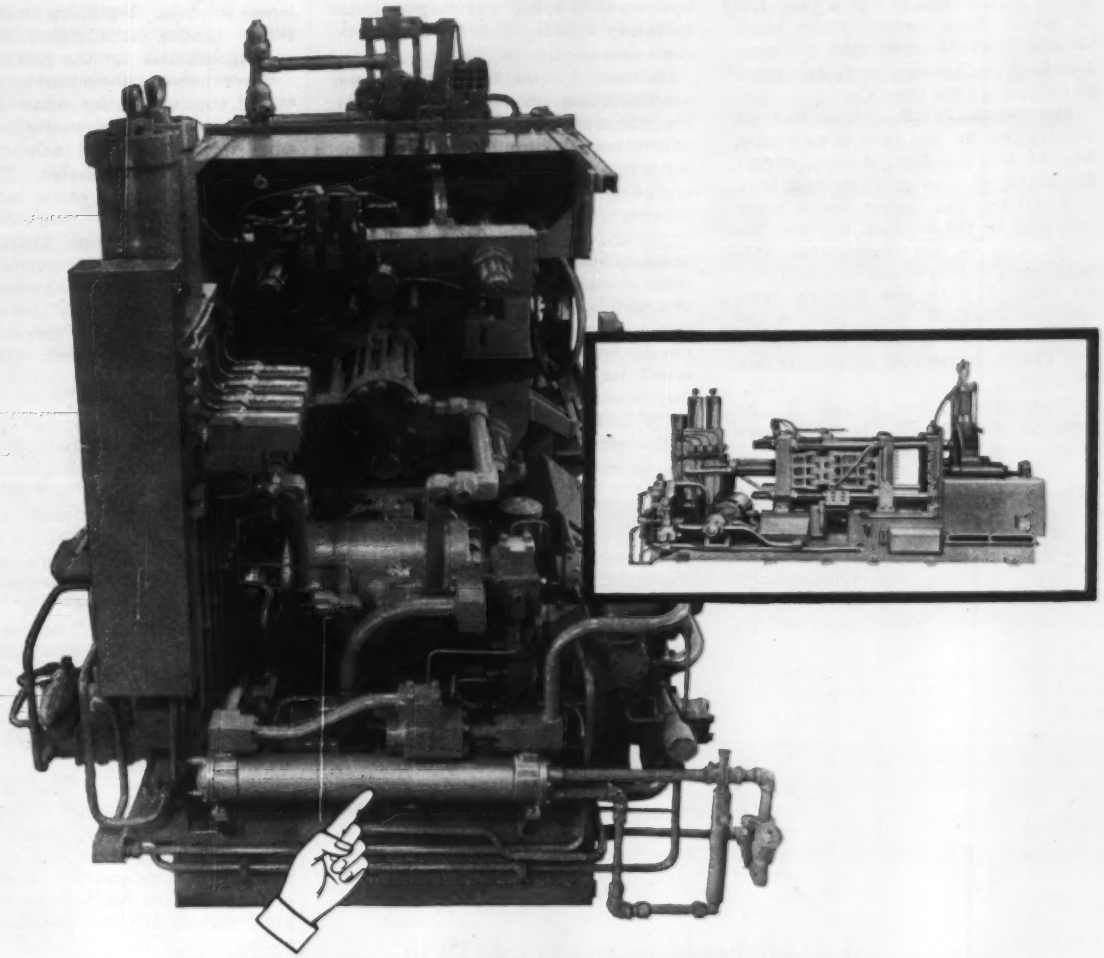

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is less active than it was a year ago at which time exceptionally large volume business came into the market. Last week area awards amounted to only about 200 tons.

Montesano, Wash., which had an inquiry out for 750 tons of cast pipe, bought another type of pipe, except for about 60 tons of 12-in. cast iron.

A natural gas supply line is being installed in the Everett, Seattle, Tacoma area by the Washington Natural Gas Co. Work is to be completed by Sept. 7, with gas arriving from the San Juan, N. Mex., field in October. The pipe is being delivered in the Pacific Northwest by various fabricators.

Youngstown Sheet & Tube Co. increased prices on its Yoloy steel pipe 7 per cent, effective Apr. 16.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 171 & 172

Auto builders are pressing for deliveries of cold-rolled and hot-rolled sheets in the Midwest more intensely than their assembly schedules would seem to warrant. This is lending support to the belief the industry is bolstering steel inventories as a hedge against higher prices and a possible steel strike this summer.

Much the same situation is reported in the East. There, also, requirements on household durables account are increasing, notably for sanitaryware. Demand from manufacturers of stoves and refrigeration equipment is brisk, and despite some inventory building, it is apparent current consumption is heavy.

Galvanized sheet delivery promises are tightening up. Government grain bin requirements, involving a 100-million-bushel storage program taking more than 60,000 tons of steel, are being reflected in more stringent offerings by the mills. Bids are to be opened Apr. 23, with deliveries to be completed by July 31. Meanwhile, farm demand for galvanized sheets and roofing is disappointing. Production has been cut back one-fourth in the St. Louis area. The farmers just aren't buying, though drouth in the Southwest and a late spring are partially to blame.

Eastern consumers may be taking in cold-rolled sheets faster than they are being fabricated. This also may apply in lesser degree to hot rolled. Still, sellers insist they still have more demand for these grades than they can promptly handle. There is some softness, however, in cold-rolled strip in the district, the easing being due primarily to application of slit sheet in many instances. In this connection, an interesting development in New England is growing use of tin mill black plate in the form of slit strip.

One midwestern sheetmaker has opened its books for the third quarter on all light flat-rolled products. Other makers are not expected to delay action for long. In New England, in fact, beginning with the silicon grades, area sellers are accepting business for the period.

Several sheetmakers that have been out of the market for some time on hot-rolled sheets reportedly will resume production and sale of this grade in the third quarter. This reflects the somewhat easier situation expected that period. Carry-overs at the end of the current quarter are likely to be less burdensome than in the last year or so. Demand for automotive tonnage for June shipment, however, could increase the carry-over beyond present estimates.

Steel Bars . . .

Bar Prices, Page 170

While demand for hot-rolled carbon bars is not so strong as it was earlier in the year, it is still active, and producers are beginning to open their books for third quarter orders. Expectations are that most mills will have taken such action within a week or ten days.

Mills confront more demand than they can promptly handle this quarter despite some easing in consumption. Buyers are striving to build up inventories as a hedge against higher prices this summer and a possible steel strike.

Protective covering also is noted in alloy and cold-finished carbon bars, but makers are not under undue pressure. Tonnage is still available for delivery this quarter. Some sellers say demand for cold-finished and alloy bars is soft, but processors are taking in all the hot stock offered them, especially in the more popular sizes.

Third quarter demand for bars may respond more to seasonal influences than either plates or shapes, but still should be substantial and hold up better than inquiry for sheets and strip.

Agricultural implement output continues to shrink under the influences of good inventories of finished machines and soft retail demand. For the next few months, requirements for carbon steel bars will fall short of previous needs in this industry. General demand for bars continues good in the Midwest so that the contraction in demand on farm implement account only serves to ease lightly the pressure on producers. Producers of alloy bars for farm equipment say plow steel and other farm needs are off to 50 or 60 per cent of capacity this month. Alloy sales usually rise on agricultural account between February and June. There was a pickup in volume in the first quarter, but demand for May and June shipment is off sharply.

Demand for bar stock by forge

Shipments of Steel Products—February, 1956

(All grades; net tons)

Products	Carbon	Alloy	Stainless	Total	YEAR TO DATE 1956	YEAR TO DATE 1955
Ingots	63,185	14,579	2,002	79,766	148,614	63,579
Blooms, slabs, etc.	171,039	51,058	2,255	224,352	452,957	394,364
Tube rounds	2,962	339	32	3,333	3,649	*
Skelp	12,194	.....	.....	12,194	26,207	16,976
Wire rods	93,604	2,130	416	96,150	200,089	173,360
Structurals (heavy)	443,826	3,418	2	447,246	883,761	674,361
Steel piling	31,854	.....	.....	31,854	62,078	48,135
Plates	601,423	37,250	2,517	641,190	1,291,070	895,684
Rails—standard	102,804	.....	.....	102,804	223,746	189,339
Rails—other	11,288	.....	.....	11,288	21,496	10,809
Joint bars	6,617	.....	.....	6,617	12,545	6,195
Tie plates	29,530	.....	.....	29,530	63,048	34,612
Track spikes	8,827	.....	.....	8,827	17,756	10,950
Wheels	28,138	67	.....	28,205	58,304	43,405
Axles	14,546	10	.....	14,556	28,013	15,605
Bars—hot rolled	614,842	189,134	4,897	808,873	1,626,464	1,253,662
Bars—reinforcing	174,133	.....	.....	174,133	356,039	243,969
Bars—cold finished	136,307	29,786	5,018	171,111	349,159	289,751
Tool steel	1,464	9,149	.....	10,613	21,726	15,724
Standard pipe	235,067	15	.....	235,082	475,372	396,652
Oil country goods	188,507	40,695	.....	229,202	476,419	364,751
Line pipe	287,653	.....	.....	287,653	561,326	254,786
Mechanical tubing	65,158	26,571	352	92,081	181,972	133,915
Pressure tubing	22,358	3,729	1,609	27,696	56,267	37,224
Wire—drawn	265,122	4,636	2,965	272,723	540,752	438,565
Nails & staples	48,597	.....	.....	48,597	98,688	100,736
Barbed wire	9,923	.....	.....	9,923	17,071	25,378
Woven wire fence	29,468	.....	.....	29,468	54,424	65,725
Bale ties	3,302	.....	.....	3,302	6,353	5,181
Black plate	70,914	.....	.....	70,914	142,006	118,953
Tin plate—HD	77,877	.....	.....	77,877	158,911	171,063
Tin plate—electrolytic	404,193	.....	.....	404,193	806,820	680,149
Sheets (hot rolled)	754,231	43,584	2,518	800,333	1,644,290	1,467,540
Sheets (cold rolled)	1,250,947	7,128	13,081	1,271,156	2,580,826	2,318,942
Sheets (galvanized)	272,997	.....	.....	272,997	542,461	410,509
Sheets (other coated)	22,882	.....	.....	22,882	47,457	40,555
Sheets (enameling)	Not available. Included in Cold rolled					42,376
Electrical sheets, strip	9,923	60,111	.....	70,034	141,934	115,555
Strip (hot rolled)	177,737	3,148	464	181,349	350,406	316,795
Strip (cold rolled)	135,639	1,577	21,073	158,289	325,053	263,633
Total 1956	6,881,078	528,114	59,201	7,468,393	15,055,529	12,129,463
Total 1955	5,677,138	393,932	48,830	6,119,900	12,129,463	.....

*Included in blooms, slabs, etc.
Data supplied by American Iron & Steel Institute

shops is up in New England. Several district automotive suppliers are again placing orders. Practically all hot-rolled carbon bar tonnage has been taken for second quarter, but the cold-finished sellers can work in some sizes for delivery this period.

Plates . . .

Plate Prices, Page 170

Platemakers are beginning to open order books for the third quarter on other than rated work which they have been accepting for some time. Apart from the possibility of a steel strike, production in the period will probably be off due to hot weather, vacations and (in some cases) equipment repairs.

Most plate mills have been under terrific strain for months, and the summer may provide some opportunity for at least a little overhauling.

New England users are unable to increase their orders beyond the established tonnage pattern. With inventories low, most shops would increase consumption if steel were available. This applies in miscellaneous manufacturing where light gage plates are required with other steel products, such as sheets and bars.

The keel for the largest tanker built to date will be laid Apr. 30 at Bethlehem's Quincy yard. Between keel and launching, 14,000 tons of steel, mostly plates, will be required.

One eastern plate producer has opened third quarter books, but others in the area have not taken action. In one instance, tonnage hasn't been distributed for June. Unlike the situation in some light flat products, plate fabrication is on a parity with shipments. Most consumers could step up plate fabrication if more steel were available. Many of them would like to build up a backlog as a hedge against higher prices this summer and a possible steel strike.

Pittsburgh producers can't get steel through the mill fast enough to fill second quarter demands. Tight supply conditions are forcing most plate users to fill a substantial part of their needs at the warehouse level, and this is becoming difficult with distributors' inventories down and out of balance. They are turning away large orders from firms that are not normally warehouse customers.

Steel plate availability is the controlling factor in heavy construction in the Chicago market, a condition that seems certain to prevail into 1957. Lack of rolling space at district plate mills is all that prevents conversion arrangements from flourishing. Fabricators are acquiring as much material as they can from warehouses, but supply from this source is meager.

Contract for the design and manufacture of a 160-in., 4-high reversing plate mill has been awarded the Mesta Machine Co., Pittsburgh, by Bethlehem Steel Co. for installation at its Sparrows Point, Md., plant. The contract also includes two automatically controlled slab reheating furnaces and charging and delivery equipment, a vertical edging mill, leveler, shears, trimmers, cooling beds, scales, tables, transfers and plate handling cranes. An existing, 3-high mill will be arranged to serve as a roughing stand.

Wire . . .

Wire Prices, Pages 172 & 173

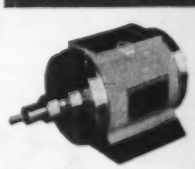
Manufacturers and industrial wire bookings for May and June are slightly heavier in New England. Incoming orders are ahead of those for April. With most finished wire products under allotment, the first month of each quarter tends to be lightest of the three. The mills are close to delivery promises on most high carbon grades, but heavy backlogs and heavy bookings tend to jam low carbon schedules, notably in sizes required for reinforcing. Most consum-

"over 14 billion revolutions and still going strong"

"50% more wheel life" "better surface finish"

"way better wavometer readings"

says this user of POPE SPINDLES



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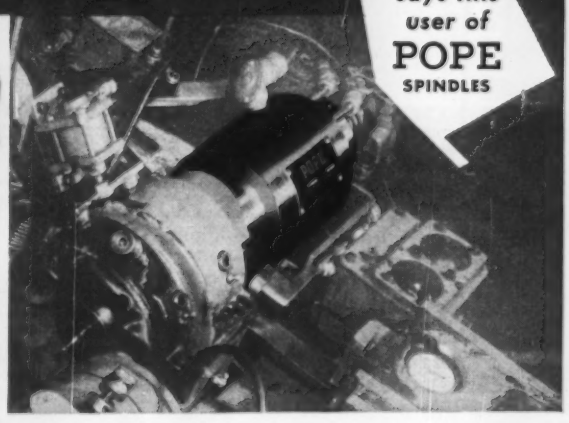
This rugged, long-lived Pope Spindle has the rigidity, both radially and axially, for continuous production of accurate parts. Spindles of similar design available for higher speeds.



THESE ARE THE BEARINGS

A pair of Fafnir Super-Precision MM20TW1-CR spring loaded ball bearings are used in the Pope Hi-Cycle Wheelhead.

THE FAFNIR BEARING COMPANY operates POPE Heavy Duty, 72,000 RPM Hi-Frequency Wheelheads on No. 1 Landis Grinders for extra precision ball bearing race grinding.

Fafnir considers the extraordinary record of these POPE wheelheads in their own plant an outstanding example of both *spindle* performance and *bearing* performance, for complete *Fafnir* ball bearings are used in these Wheelheads.

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No. 109

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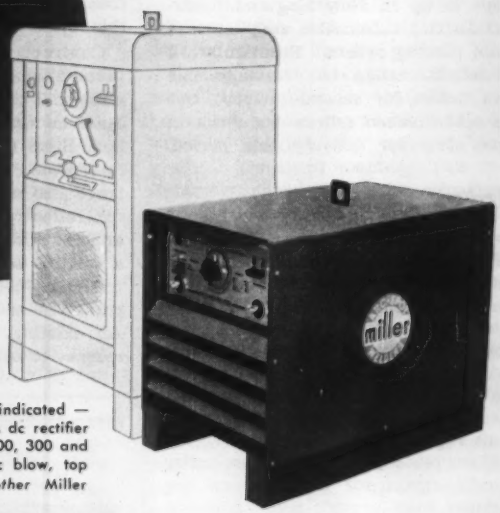

Where floor space is a problem — or where stacking and paralleling is indicated — the new Miller SRH LOWBOY is the engineered-to-your-needs answer! This dc rectifier type welder is available in three models with 60% duty cycle ratings of 200, 300 and 400 amperes. Combining compactness with quiet operation, minimum arc blow, top electrical efficiency and waterproof construction, the LOWBOY is *another* Miller first that "figures."

Upright SR models to 600 amperes at 40 volts with 750 amperes maximum output; Duplex units up to 1200 amperes, 40 volts, 1500 amperes maximum.

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New

MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some ... you'll *like* the job they do.

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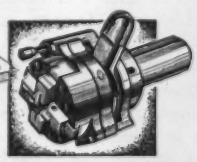

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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ers are buying near estimated requirements, with hedging against price increases limited.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 170

Reinforcing bar order backlogs in the Pacific Northwest are said to be sufficient to support mill operations into the third quarter. Operations are near capacity. Discussion of proposed mill price increases has not gone beyond the talking stage, and expectations are nothing will be done until after a new labor contract is arranged at midyear. Active church and school construction throughout the area is absorbing large tonnages of reinforcing bars and shapes, mostly in small lots. In addition, highway projects continue to provide substantial demands.

Structural Shapes . . .

Structural Shape Prices, Page 170

The stringency in wide flange sections has been made particularly acute by the blanking out of some tonnage by one producing mill in an effort to become more current with shipment promises. Standard shapes are in relatively better supply.

Most fabricators are figuring they will have supply problems throughout the year with plates as well as shapes.

Shape producers in the Midwest report no cancellations or setbacks in orders, and they expect none in the third quarter. The shortage of plain material for fabrication, however, will serve as a brake on construction during the year. In fact, a substantial number of building projects are being redesigned for reinforced concrete construction.

At the moment, there is less bridge estimating in New England, and this accounts for something of a slackening in fabricated structural inquiry in the area. All outstanding contracts for the Connecticut turnpike, involving 65,000 tons, have been placed.

Demand for light industrial plants, schools and defense bases are maintained in the district, but fabricating shop schedules are retarded by the limited supply of steel. Most fabricators are behind schedule and will lose more ground through this quarter unless they are in receipt of heavier steel tonnage.

The shortage of structurals makes bidding difficult on the West Coast where sizable awards are reported pending. They include 5500 tons for a Columbia river bridge, 4300 tons for bridge approaches at Portland,

Ores

Lake Superior Iron Ore

(Prices effective for the 1956 shipping season, gross ton, 51.50% iron natural, rail of vessel, lower lake ports)

Old range bessemer	$11.25
Old range nonbessemer	11.10
Mesabi bessemer	11.00
Mesabi nonbessemer	10.85
Open-hearth lump	12.10
High phos.	10.85

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Dec. 1, 1955, and increases or decreases after such date are for seller's account.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

Foundry and basic 52-62% concentrates contract	17.00-18.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 60-68%	20.00
N. African hematite (spot)	nom. 18.00-20.00

Brazilian iron ore, 68-69% 13.00c, f.o.b. Victoria.

Tungsten Ore

Net ton unit, before duty

Foreign, wolframite, good commercial quality	$33.00-$35.50
Domestic, scheelite, mine	63.00

Manganese Ore

Mn 48%, delivery within six months, $1.15 nom. per long ton unit, c.i.f. U. S. ports, duty for buyer's account; 46-47%, $1.05 nom.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and African

48% 2.8:1	nom. $45.00-$50.00
48% 3:1	42.00-44.00
48% no ratio	34.00

South African Transvaal

44% no ratio	$19.00-$20.00
48% no ratio	33.00-35.00

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulphide concentrate, per lb of mo content, mines, unpacked	$1.10

Antimony Ore

Per unit of Sb content, c.i.f. seaboard

55-60%	$3.60-$3.85
60-65%	3.85-4.00

Vanadium Ore

Cents per lb V_2O_5 content, deld. mills	
Domestic	31.00

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $122; Salina, Pa., $127; Niles, O., $133.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Pa., New Savage, Md., St. Louis, $150.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Windham, Portsmouth, O., Hawstone, Pa., $128; Warren, Niles, O., Hays, Pa., $133; Morrisville, Pa., $131.50; E. Chicago, Ind., Joliet, Rockdale, Ill., $138; Lehigh, Utah, $144; Los Angeles, $151.

Super Duty: Hays, Sproul, Hawstone, Pa., Warren, Windham, O., Leslie, Md., Athens, Tex., $145; Morrisville, Pa., Niles, O., $148; Joliet, Ill., $151; Curtner, Calif., $163.

Semisilica Brick (per 1000)

Clearfield, Pa., $139; Philadelphia, $124; Woodbridge, N. J., $122.

Ladle Brick (per 1000)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Pa., Mexico, Vandalia, Mo., $88.50; Wellsville, O., $92.50; Clearfield, Pa., Portsmouth, O., $98.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $194; Danville, Ill., $197; Philadelphia, Clearfield, Pa., $201.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $241; Danville, Ill., $244; Philadelphia, Clearfield, Pa., $248.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $279; Danville, Ill., $281; Clearfield, Pa., Philadelphia, $286.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $157; Clearfield, Pa., $158.50; St. Louis, $169.30.

Nozzles (per 1000)

Reesdale, Pa., $253.70; Johnstown, Pa., $259.20; Clearfield, Pa., $259.40; St. Louis, $259.45; Bridgeburg, Pa., $258.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $196; Clearfield, Pa., $198; St. Louis, $195.80.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, O., Gibsonburg, Nario, O., $15; Thornton, McCook, Ill., $15.60; Dolly Siding, Bonne Terre, Mo., $14.

Magnesite (per net ton)

Domestic, dead-burned, bulk, ¼-in. grains with fines: Chewelah, Wash., $40; Luning, Nev., $40. ⅜-in. grains with fines: Baltimore, $66.40.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace	$13.75-14.50
Connellsville, foundry	16.00-17.00

Oven Foundry Coke

Birmingham, ovens	$25.65
Cincinnati, deld.	30.58
Buffalo, ovens	27.50
Buffalo, deld.	28.75
Camden, N. J., ovens	26.50
Chicago, ovens	27.00
Chicago, deld.	28.50
Detroit, ovens	27.50
Detroit, deld.	28.50
Pontiac, deld.	29.06
Saginaw, deld.	30.58
Erie, Pa., ovens	27.50
Everett, Mass., ovens New England, deld.	*28.55
Indianapolis, ovens	26.75
Ironton, O., ovens	26.00
Cincinnati, deld.	28.59
Kearny, N. J., ovens	26.75
Lone Star, Tex., ovens	19.50
Milwaukee, ovens	27.50
Neville Island, (Pittsburgh) Pa., ovens	26.25
Painesville, O., ovens	27.50
Cleveland, deld.	29.43
Philadelphia, ovens	26.50
St. Louis, ovens	28.50
St. Paul, ovens	26.50
Swedeland, Pa., ovens	26.50
Terre Haute, Ind., ovens	26.75

*Or within $4.55 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	36.00
Toluene, one deg.	32.00-34.00
Industrial xylene	32.00-35.00

Per ton, bulk, ovens

Ammonium sulphate	$42-$45
Birmingham area	42.00†

†With port equalization against imports.

Cents per pound, producing point

Phenol: Grade 1, 15.00; Grade 2-3, 14.50; Grade 4, 16.50; Grade 5, 15.25.	

Fluorspar

Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $38-$39; 70%, $35-$36; 60%, $31-$32. Imported, net tons, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $34; Mexican, $26.50.

Electrodes

Threaded with nipple, unboxed, f.o.b. plant

Inches Diam	Length	Per 100 lb
GRAPHITE		
2	24	$52.50
2½	30	33.75
3	40	32.00
4	40	30.25
5½	40	30.00
6	60	27.25
7	60	26.75
8, 9, 10	60	24.25
12	72	27.25
14	60	23.50
16	72	22.50
17	60	23.00
18	72	22.50
20	72	22.25
CARBON		
8	60	12.10
10	60	11.80
12	60	11.75
14	60	11.70
14	72	10.85
17	60	10.75
17	72	10.35
20	84	10.30
20	90	10.10
24	72, 84	10.30
24	96	10.05
30	84	10.20
40, 35	110	9.90
40	100	9.90

Oreg., and 4000 tons for a hospital at Seattle.

The American Gas & Electric Services Corp. has closed on 7000 tons of transmission towers for installation at Macksburg, O., to an Italian fabricator. This is the first important award of this character to have been placed abroad in recent years. Shipment, it is reported, does not involve important problems. The tower sections nest easily.

Metallurgical Coke . . .

Metallurgical Coke Prices, Page 183

The Donner-Hanna Coke Corp., blast furnace coke producer, plans construction costing more than $187,000 at its Buffalo plant. The project was disclosed in plans filed by the company with the City Buildings Division.

Fluorspar . . .

Fluorspar Prices, Page 183

Pennsalt International Corp., subsidiary of Pennsylvania Salt Mfg. Co., Philadelphia, recently imported the first shipload of metallurgical grade fluorspar from its affiliated mining company in Mexico, Minerals y Metales Industriales. Shipped from Tampico, the initial cargo of 4400 tons was transhipped by rail to Bethlehem Steel plants at Johnstown, Steelton and Bethlehem, Pa.

The Pennsylvania Salt Mfg. Co. holds large reserves of acid grade fluorspar in Livingston county, Ky., where new mining and expanded milling facilities are scheduled for completion late this month.

Rails, Cars . . .

Track Material Prices, Page 173

Wheel shortages are proving to be a bottleneck in the railroad car construction and repair program. Five steel companies have wheel producing facilities, but they haven't been able to step up semifinished steel output sufficiently to permit them to keep pace with demand—it largely resulted from the terrific spurt in freight car buying late last year. Some shops are booked into 1957.

Armco Steel Corp. is supplementing wheel facilities at Butler, Pa., with a new unit which will be in operation late this year. Present facilities will cease production this summer, but sufficient stocks will be built up by that time, it is believed, to meet normal demands until the new facilities get going.

Semifinished Steel . . .

Semifinished Prices, Page 170

An all-time weekly production record for steel ingots was established in the Chicago area in the week ended Apr. 15 when district furnaces operated at a revised 103 per cent of capacity. Indicated output was 490,000 tons. Percentagewise, the performance was the best since the 104 per cent for the week ended Aug. 15, 1953. Previous record: An indicated 483,000 tons in the weeks ended Jan. 29 and Feb. 5, this year, when operations were at 101.5 per cent of capacity.

Fasteners . . .

Bolt, Nut, Rivet Prices, Page 173

A new system of pricing machine, carriage and lag bolts on a net basis was announced to distributors last week by Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa. Replacing the traditional practice of pricing on the basis of lists and discounts, the new schedules indicate direct factory costs to distributors of full cases and 20,000-lb lots. Prices are for regular packaged stock and for larger and longer sizes normally shipped in bulk.

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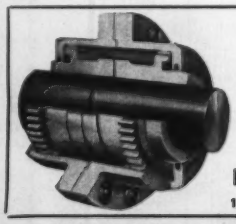

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Current Ferroalloy Quotations

MANGANESE ALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton, Pa. 21-23% Mn, $96.50; 19-21% Mn, 1-3% Si, $94; 16-19% Mn, $92.

Standard Ferromanganese: (Mn 74-76%, C 7% approx.) Base price per net ton $215. Duquesne, Johnstown, Sheridan, Pa.; Philo, O.; Tacoma, Wash.; Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74%, respectively.

(Mn 79-81%). Lump $223 per net ton, f.o.b. Anaconda or Great Falls, Mont. Add $2.60 for each 1% above 81%; subtract $2.60 for each 1% below 79%, fractions in proportion to nearest 0.1%.

Low-Carbon Ferromanganese, Regular Grade: (Mn 85-90%). Carload, lump, bulk, max. 0.07% C, 31.95c per lb of contained Mn, carload packed 33c, ton lots 34.5c, less ton 35.7c. Delivered. Deduct 1.5c for max 0.15% C grade from above prices, 3c for max 0.30% C, 3.5c for max 0.50% C, and 6.5c for max 75% C—max 7% Si. **Special Grade:** (Mn 90% min, C 0.07% max, P 0.06% max). Add 2.05c to the above prices. Spot, add 0.25c.

Medium-Carbon Ferromanganese: (Mn 80-85%, C 1.25-1.5%, Si 1.5% max). Carload, lump, bulk 22.85c per lb of contained Mn, packed, carload 23.9c, ton lot 25.5c, less ton 26.7c. Delivered. Spot, add 0.25c.

Manganese Metal: 2" x D (Mn 95.5% min, Fe 2% max, Si 1% max, C 0.2% max). Carload, lump, bulk, 45c per lb of metal; packed, 45.75c; ton lot 47.25c; less ton lots 49.25c. Delivered. Spot, add 2c.

Electrolytic Manganese Metal: Min carload, 31.5c; 2000 lb to min carload, 33.5c; 250 lb to 1999 lb, 35.5c; less than 250 lb, 36.5c. Preminum for hydrogen-removed metal, 0.75c per lb. Prices are f.o.b. cars, Knoxville, Tenn., freight allowed to St. Louis or to any point east of Mississippi; or f.o.b. Marietta, O., freight alowed.

Silicomanganese: (Mn 65-68%). Contract, lump, bulk 1.50% C grade, 18-20% Si, 12c per lb of alloy. Packed, c.l. 13c, ton 13.45c, less ton 14.45c, f.o.b. Alloy, W. Va., Ashtabula, O., Marietta, O., Sheffield, Ala., Portland, Oreg. For 2% C grade, Si 15-17%, deduct 0.2c from above prices. For 3% C grade, Si 12-14.5%, deduct 0.4c from above prices. Spot, add 0.25c.

TITANIUM ALLOYS

Ferrotitanium, Low-Carbon: (Ti 20-25%, Al 3.5% max, Si 4% max, C 0.10% max). Contract, ton lots 2" x D, $1.50 per lb of contained Ti; less ton $1.55. (Ti 38-43%, Al 8% max, Si 4% max, C 0.10% max). Ton lots $1.35, less ton $1.37 f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis. Spot, add 5c.

Ferrotitanium, High-Carbon: (Ti 15-18%, C 6-8%). Contract $200 per ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi river and north of Baltimore and St. Louis.

Ferrotitanium, Medium-Carbon: (Ti 17-21%, C 2-4.5%. Contract $225 per ton, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

CHROMIUM ALLOYS

High-Carbon Ferrochrome: Contract, c.l., lump, bulk 26.25c per lb of contained Cr; c.l. packed 27.5c, ton lot 29.25c, less ton 30.65c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome: (Cr 67-71%). Contract, carload, lump, bulk, C 0.025% max (Simplex) 31.75c per lb contained Cr, 0.02% max 38.50c, 0.03% max 38c, 0.06% max 36.50c, 0.1% max 36c, 0.15% max 35.75c, 0.2% max 35.50c, 0.5% max 35.25c, 1.0% max 34c, 1.5% max 33.85c, 2.0% max 33.75c. Ton lot, add 3.1c, less ton add 4.8c. Carload packed add 1.45c. Delivered. Spot, add 0.25c.

Foundry Ferrochrome, High-Carbon: (Cr 62-66%, C 5-7%, Si 7-10%). Contract, c.l. 2 in. x D, bulk 27.4c per lb contained Cr. Packed, c.l. 28.7c, ton 30.5c, less ton 32c. Delivered. Spot, add 0.25c.

Foundry Ferrochrome, Low-Carbon: (Cr 50-54%, Si 28-32%, C 1.25% max). Contract, carload, packed 8 M x D, 19.6c per lb of alloy, ton lot 20.85c; less ton lot, 22.05c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome-Silicon: (Cr 39-41%, Si 42-49%, C 0.05% max). Contract, carload, lump, 4" x down and 2" x down, bulk, 39.05c per lb of contained Cr; 1" x down, bulk 39.8c. Delivered.

Chromium Metal, Electrolytic: Commercial grade (Cr 99.8% min, metallic basis, Fe 0.2 max). Contract, carlot, packed 2" x D plate (about ¼" thick) $1.25 per lb, ton lots $1.27, less ton lots $1.29. Delivered. Spot, add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open-hearth Grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.10 per lb of contained V. Delivered. Spot, add 10c. **Special Grade** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.20. **High Speed Grade** (V 50-55%, or 70-75%, Si 1.50% max, C 0.20% max) $3.30.

Grainal: Vanadium Grainal No. 1, $1.05 per lb; No. 6, 68c; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract, less carload lots, packed, $1.33 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

25-30% Ferrosilicon: Contract, carload, lump, bulk, 20.0c per lb of contained Si. Packed 21.40c; ton lot 22.50c f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

50% Ferrosilicon: Contract, carload, lump, bulk, 12.75c per lb of contained Si. Packed, c.l. 14.85c, ton lot 16.3c, less ton 17.95c. F.o.b. Alloy, W. Va., Ashtabula, Marietta, O., Sheffield, Ala., and Portland, Oreg. Spot, add 0.45c.

Low-Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.2c to 50% ferrosilicon prices.

65% Ferrosilicon: Contract, carload, lump, bulk, 14.5c per pound contained silicon. Packed, c.l. 16.2c, ton lots, 18c; less ton, 19.35c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Contract, carload, lump, bulk, 15.4c per lb of contained Si. Packed, c.l. 17.05c, ton lot 18.7c, less ton 19.95c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Contract, carload, lump, bulk, 18.5c per lb of contained Si. Packed, c.l. 19.95c, ton lot 21.35c, less ton 22.4c. Delivered. Spot, add 0.25c.

Silicon Metal: (Min 98% Si, 0.75% max Fe, 0.07 max Ca). C.l. lump, bulk, 20.5c per lb of Si. Packed, c.l. 21.95c, ton lot 23.25c, less ton 24.25c. Add 0.5c for max 0.03 Ca grade. Deduct 0.5c for max 2% Fe grade analyzing min 96.5% Si. Spot, add 0.25c.

Alsifer: (Approx. 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 10.65c per lb of alloy, ton lots packed 11.8c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l. lump, bulk 8.5c per lb of alloy. Packed, c.l. 9.5c, ton lot 10.65c, less ton 11.5c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Contract, carload, lump, packed 26.25c per lb of alloy, ton lot 27.4c, less ton 28.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy; less than 100 lb $1.30. Delivered. Spot, add 5c. F.o.b. Washington, Pa., prices, 100 lb and over, are as follows: Grade A (10-14% B) 85c per pound; Grade B (14-18% B) $1.20; Grade C (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). $5.25 per lb contained B, delivered to destination.

Bortam: (B 1.5%-1.9%). Ton lots, 45c per lb; smaller lots, 50c per lb.

Carbortam: (B 1 to 2%). Contract, lump, carloads 9.50c per lb, f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Contract, carload, lump, bulk 22c per lb of alloy, carload packed 23.05c, ton lot 24.95c, less ton 25.95c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Contract, carload, lump, bulk 21.5c per lb of alloy, carload packed 22.95c, ton lot 25.25c, less ton 26.75c. Delivered. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx. 3¾ lb each and containing 2 lb of Cr). Contract, carload, bulk, 16.95c per lb of briquet, carload packed in box pallets 17.15c, in bags 17.85c; 3000 lb to c.l. in box pallets 18.35c; 2000 lb to c.l. in bags, 19.05c; less than 2000 lb in bags 19.95c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx. 3 lb and containing 2 lb of Mn). Contract, carload, bulk 13c per lb of briquet, c.l. packed, pallets 13.2c, bags 14c; 3000 lb to c.l., pallets 14.4c; 2000 lb to c.l. bags, 15.2c, less ton 16.1c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx. 3½ lb and containing 2 lb of Mn and approx. ½ lb of Si). Contract, c.l. bulk 13.55c per lb of briquet, c.l. packed, pallets, 13.75c; bags 14.55c, 3000 lb to c.l., pallets, 14.95c; 2000 lb to c.l., bags, 15.75c; less ton 16.65c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx. 5 lb and containing 2 lb of Si). Contract, carload, bulk 7.15c per lb of briquet; packed, pallets, 7.35c; bags, 8.15c; 3000 lb to c.l., pallets, 8.95c; 2000 lb to c.l. bags 9.75c; less ton 10.65c. Delivered. Spot, add 0.25c.

(Small size—Weighing approx. 2½ lb and containing 1 lb of Si). Carload, bulk 7.3c. Packed, pallets 7.5c; bags 8.30c; 3000 lb to c.l. pallets 9.1c; 2000 lb to c.l. bags 9.9c; less ton 10.8c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each) $1.33 per pound of Mo contained, f.o.b. Langeloth, Pa.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%), 5000 lb W or more $3.45 per lb of contained W; 2000 lb W to 5000 lb W, $3.55; less than 2000 lb W, $3.67. Delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 50-60%, Si 8% max, C 0.4% max). Contract, ton lot, 2" x D, $6.90 per lb of contained Cb. Delivered. Spot, add 10c.

Ferrotantalum—Columbium: (Cb 40% approx., Ta 20% approx., and Cb plus Ta 60% min C 0.30% max). Ton lots, 2" x D, $4.65 per lb of contained Cb plus Ta, delivered; less ton lots $4.70.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7%, Fe 20% approx.) Contract, c.l. packed ½ in. x 12 M, 18.5c per lb of alloy, ton lots 19.65c, less ton 20.9c. Delivered. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5-7%, Ti 9-11%). C.l. packed, 18.5c per lb of alloy, ton lots 19.65c; less ton lots 20.9c, f.o.b. Niagara Falls, N. Y.; freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 17.2c per lb of alloy; ton lots 18.7c; less ton lots 19.95c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Siminal: (Approx. 20% each Si, Mn, Al; bal. Fe). Lump, carload, bulk 17.50c. Packed c.l. 18.50c, 200 lb to c.l. 19.50c, less than 2000 lb 20c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $4 for each 1% of P above or below the base; carload, f.o.b. sellers' works, Mt. Pleasant, Siglo, Tenn., $90 per gross ton.

Ferromolybdenum: (55-75%). Per lb contained Mo, in 200-lb containers, f.o.b. Langeloth, Pa., $1.54 in all sizes except powdered which is $1.66; Washington, Pa., furnace, any quantity $1.46.

Technical Molybdic-Oxide: Per lb contained Mo, f.o.b. Langeloth, Pa.; $1.31 in cans; in bags, $1.30, f.o.b. Langeloth, Pa.; $1.24, Washington, Pa.

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LEADERS IN IRON AND STEEL SCRAP SINCE 1889

Scrap . . .

Scrap Prices, Page 188

Philadelphia — While the prime grades of open-hearth scrap are unchanged, prices on several other grades are higher. Trading is light, however, as consumers are moving cautiously with the market at its present high average level. No. 2 bundles are higher at $45, delivered; mixed borings and turnings, $39; machine shop turnings, $38; short shoveling turnings, $42; and heavy turnings, $52. Also, low phos structurals and plates are stronger at $59-$60, delivered; couplers, springs and wheels are $62; and rail crops, $68. No. 1 cupola is higher at $49-$51, delivered, and drop broken machinery, $56. Other grades are unchanged.

Pittsburgh — Railroad scrap is strong. No. 1 railroad heavy melting jumped to $66 last week as several lists closed. Rail specialties sold for $70, while a premium quality of specialties commanded $72. Rails were quoted $3 to $4 higher than the week before, with 2-ft rails selling for about $75 a ton.

Punchings and plate scrap and cut structurals were also active. Both were up $2 over earlier quotations.

Boston—No. 1 heavy melting steel advanced another $1, shipping point, with other steelmaking grades holding at high level, but, for the most part, unchanged. Higher price for prime scrap aims at loosening up tonnage to meet orders. Buying for export is light, with domestic prices equal to or slightly above those on material for dock delivery. Cast grades are slightly stronger, but, on the whole, have not kept pace with the rise in steel scrap.

New York—Brokers have advanced buying prices on short shoveling turnings to $33-$34 and on unstripped motor blocks to $33-$35. Other grades are unchanged, but strong.

Buffalo—Cast scrap has increased $2 to $3 on new purchases. Cupola cast is quoted $51 and No. 1 machinery $55. Prices on No. 2 heavy melting and No. 2 bundles are off $3 a ton because of completion of shipments on a limited tonnage order. Another consumer is taking No. 2 heavy melting at $42 and No. 2 bundles at $39, and those figures are considered representative of the market. No. 1 heavy melting is quoted $56 based on what brokers are paying for prime scrap to be shipped to Youngstown. Low phos is up $1 to $58.

Youngstown—Scrap prices are strong here. Steel mills are trying to boost pig iron use to offset high-priced scrap in their open-hearth melts. Youngstown Sheet & Tube Co. is reported to have paid $61 for No. 1 industrial material, but $59-$60 is considered more representative of the current market on No. 1 heavy melting. No. 1 bundles command $58-$59.

Cleveland—Less pressure is evident in the market, though the undertone continues strong. For the moment, however, prices appear to be holding at levels recently established. Some railroad steel, largely old locomotives, went at $66 in the Valley. This piece of business has served to add to market strength. A Valley steelmaker paid $62 for low phos.

Cincinnati—Scrap steel prices have reached a plateau here. Foundry grades have followed the early upward movement in blast furnace material. They are generally quoted about $1 higher.

Chicago—Price stability prevails in the scrap market, but it is believed that is so only because mills are resisting higher prices. In fact, there are reports that the mills are offering less for major grades than they paid on their last purchases. However, bearishness in the situation is overridden by steelmaking operations which are continuing at full capacity. In the week ended Apr. 15, a new all-time ingot output was established. This suggests high level scrap consumption.

St. Louis—The scrap market here shows definite signs of easing, though there has been no lowering of prices. Pressure for higher prices, however, has been arrested. Material is being brought into the area from outlying districts and involves the payment of considerable freight. The only changes in brokers' buying prices are in the railroad grades.

Birmingham—Prices paid by northern mills are reflected in the southern market only in brokers' purchases. To fill old orders, they are taking losses of $3 to $4 a ton on some grades. Buyers of open-hearth scrap are out of the market, but small purchases of electric furnace material have been made.

Los Angeles—The scrap market appears to be a little firmer, dealers report. While the mills are purchasing in somewhat larger volume and foundry grades are moving better, the basic undertone of the market continues soft.

Seattle—Scrap prices are firm. Dealers expect a further rise, with demand brisk. Mill inventories are adequate, but consumers are not oversupplied, and they continue to purchase regularly.

Exports are in good volume. One carrier (cargo capacity, 9500 tons) has been chartered at $195,000, Pacific Coast to Japan. This means a freight rate of $20 or more per ton, in addition to the consignee paying loading and discharge costs.

Several other vessels have been chartered at equally high rates. From North Atlantic and Gulf ports rates range from $225,000 to $230,000 per ship. Similar business two years ago would have been at less than one-half today's rates.

Pig Iron . . .

Pig Iron Prices, Page 175

Movement of pig iron is steady, with consumption maintained at a high level.

Consumers' inventories generally are at normal levels. They are heavy at some of the larger pipe shops. One pipe shop has in excess of a six-month supply (based on a normal rate of operation). This covering has been going on for quite a while as a hedge against higher prices and a possible steel strike. Over-all demand for merchant iron is strong and may become still more active as the smaller consumers step up their protective covering later in the quarter.

The principal producer of merchant iron in the Buffalo district is shutting

(*Please turn to page* 190)

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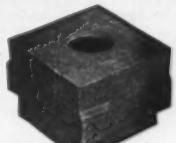

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Iron and Steel Scrap

Consumer prices, per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Apr. 18	$55.00
Apr. 11	55.00
Mar. Avg.	50.21
Apr. 1955	36.73
Apr. 1951	44.00

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania

PITTSBURGH

No. 1 heavy melting	54.00-55.00
No. 2 heavy melting	47.00-48.00
No. 1 bundles	54.00-55.00
No. 2 bundles	45.00-46.00
No. 1 busheling	54.00-55.00
Machine shop turnings	*39.00-40.00*
Mixed borings, turnings	*39.00-40.00*
Short shovel turnings	*42.00-43.00*
Cast iron borings	*42.00-43.00*
Cut structurals, 3 ft lengths	*64.00-65.00*
Heavy turnings	*48.00-49.00*
Punchings & plate scrap	*64.00-65.00*
Electric furnace bundles	*60.00-61.00*

Cast Iron Grades

No. 1 cupola	52.00-53.00
Charging box cast	48.00-49.00
Heavy breakable cast	48.00-49.00
Unstripped motor blocks	35.00-36.00
No. 1 machinery cast	57.00-58.00

Railroad Scrap

No. 1 R.R. heavy melt.	*65.00-66.00*
Rails, 2 ft and under	*74.00-75.00*
Rails, 18 in. and under	*75.00-76.00*
Rails, random lengths	*69.00-70.00*
Railroad specialties	*69.00-70.00*

Stainless Steel Scrap

18-8 bundles & solids	345.00-355.00
18-8 turnings	240.00-250.00
430 bundles & solids	110.00-120.00
430 turnings	60.00-65.00

CLEVELAND

No. 1 heavy melting	57.00-58.00
No. 2 heavy melting	50.00-51.00
No. 1 bundles	57.00-58.00
No. 2 bundles	44.00-45.00
No. 1 busheling	57.00-58.00
Machine shop turnings	32.00-33.00
Mixed borings, turnings	36.00-37.00
Short shovel turnings	36.00-37.00
Cast iron borings	36.00-37.00
Low phos.	59.00-60.00
Cut structural plates 2 ft and under	62.00-63.00
Alloy free, short shovel turnings	37.00-38.00
Electric furnace bundles	58.00-59.00

Cast Iron Grades

No. 1 cupola	58.50-59.50
Charging box cast	50.00-51.00
Stove plate	55.00-56.00
Heavy breakable cast	49.00-50.00
Unstripped motor blocks	34.00-35.00
Brake shoes	45.00-46.00
Clean auto cast	58.50-59.50
Burnt cast	45.00-46.00
Drop broken machinery	59.00-60.00

Railroad Scrap

No. 1 R.R. heavy melt.	*60.00-61.00*
R.R. malleable	65.00-66.00
Rails, 2 ft and under	74.50-75.50
Rails, 18 in. and under	73.00-74.00
Rails, random lengths	69.00-70.00
Cast steel	62.00-63.00
Railroad specialties	62.00-63.00
Uncut tires	63.00-64.00
Angles, splice bars	68.00-69.00
Rails, rerolling	71.00-72.00

Stainless Steel

(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	345.00-355.00
18-8 turnings	205.00-215.00
430 clips, bundles, solids	105.00-115.00
430 turnings	55.00-65.00

YOUNGSTOWN

No. 1 heavy melting	*60.00-61.00*
No. 2 heavy melting	47.00-48.00
No. 1 bundles	*60.00-61.00*
No. 2 bundles	44.00-45.00
No. 1 busheling	*60.00-61.00*
Machine shop turnings	33.00-34.00
Short shovel turnings	37.00-38.00
Cast iron borings	37.00-38.00
Low phos.	*61.00-62.00*
Electric furnace bundles	59.00-60.00

Railroad Scrap

No. 1 R.R. heavy melt.	*65.00-66.00*

CHICAGO

No. 1 heavy melting	53.00-56.00
No. 2 heavy melting	44.00-45.00
No. 1 factory bundles	57.00-58.00
No. 1 dealer bundles	53.00-54.00
No. 2 bundles	41.00-42.00
No. 1 busheling	53.00-56.00
Machine shop turnings	31.00-32.00
Mixed borings, turnings	33.00-34.00
Short shovel turnings	33.00-34.00
Cast iron borings	33.00-34.00
Cut structurals, 3 ft	57.00-58.00
Punchings & plate scrap	58.00-59.00

Cast Iron Grades

No. 1 cupola	51.00-52.00
Stove plate	44.00-45.00
Unstripped motor blocks	40.00-41.00
Clean auto cast	55.00-56.00
Drop broken machinery	55.00-56.00

Railroad Scrap

No. 1 R.R. heavy melt.	57.00-58.00
R.R. malleable	63.00-64.00
Rails, 2 ft and under	71.00-72.00
Rails, 18 in. and under	72.00-73.00
Angles, splice bars	66.00-67.00
Rails, rerolling	72.00-73.00

Stainless Steel Scrap

18-8 bundles & solids	345.00-360.00
18-8 turnings	250.00-260.00
430 bundles & solids	105.00-110.00
430 turnings	55.00-60.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*54.00*
No. 2 heavy melting	*46.00*
No. 1 bundles	*54.00*
No. 2 bundles	*37.00*
No. 1 busheling	*54.00*
Machine shop turnings	24.00
Mixed borings, turnings	24.00
Short shovel turnings	28.00
Punchings & plate scrap	65.00

Cast Iron Grades

No. 1 cupola	46.00
Charging box cast	39.00
Stove plate	38.00
Heavy breakable	38.00
Unstripped motor blocks	27.00
Clean auto cast	52.00
Malleable	52.00

BIRMINGHAM

No. 1 heavy melting	37.00-38.00
No. 2 heavy melting	34.00-35.00
No. 1 bundles	37.00-38.00
No. 2 bundles	29.00-30.00
No. 1 busheling	37.00-38.00
Cast iron borings	21.50-22.50
Short shovel turnings	32.00-33.00
Machine shop turnings	31.00-32.00
Electric furnace bundles	44.00-45.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	47.50-48.00
Stove plate	44.50-45.50
Bar crops and plate	51.00-52.00
Structural & plate, 2 ft	49.00-50.00
Unstripped motor blocks	37.00-38.00
Charging box cast	32.00-33.00
No. 1 wheels	39.00-40.00

Railroad Scrap

No. 1 R.R. heavy melt.	49.00-50.00
Rails, 18-in. and under	*61.00-62.00*
Rails, rerolling	63.00-64.00
Rails, random lengths	*58.00-59.00*
Angles, splice bars	58.00-59.00

PHILADELPHIA

No. 1 heavy melting	56.00
No. 2 heavy melting	47.00
No. 1 bundles	56.00
No. 2 bundles	*45.00*
No. 1 busheling	56.00
Electric furnace bundles	57.00
Mixed borings, turnings	*39.00*
Machine shop turnings	*38.00*
Short shovel turnings	*42.00*
Heavy turnings	*52.00*
Structurals & plates	*59.00-60.00*
Couplers, springs, wheels	*62.00*
Rail crops, 2 ft & under	*68.00*

Cast Iron Grades

No. 1 cupola	*49.00-51.00*
Malleable	68.00
Heavy breakable cast	54.00
Drop broken machinery	*56.00*

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	49.00-50.00
No. 2 heavy melting	40.00-41.00
No. 1 bundles	49.00-50.00
No. 2 bundles	37.00-38.00
Machine shop turnings	29.50-30.50
Mixed borings, turnings	31.00-32.00
Short shovel turnings	*33.00-34.00*
Low phos. (structural & plate)	50.00-51.00

Cast Iron Grades

No. 1 cupola	42.00-43.00
Unstripped motor blocks	*33.00-35.00*
Heavy breakable	46.00-47.00

Stainless Steel

18-8 sheets, clips solids	320.00-325.00
18-8 borings, turnings	150.00-160.00
430 sheets, clips, solids	120.00-125.00
410 sheets, clips, solids	100.00-105.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*47.50-48.00*
No. 2 heavy melting	36.00-36.50
No. 1 bundles	*46.50-47.00*
No. 2 bundles	34.00-34.50
No. 1 busheling	46.00-47.00
Machine shop turnings	28.00-28.50
Mixed borings, turnings	29.00-29.50
Short shovel turnings	31.00-31.50
No. 1 cast	*41.50-42.00*
Mixed cupola cast	*39.00-39.50*
No. 1 machinery cast	*44.00-44.50*

BUFFALO

No. 1 heavy melting	55.00-56.00
No. 2 heavy melting	*41.00-42.00*
No. 1 bundles	55.00-56.00
No. 2 bundles	*38.00-39.00*
No. 1 busheling	55.00-56.00
Mixed borings, turnings	31.00-32.00
Machine shop turnings	31.00-32.00
Short shovel turnings	34.00-35.00
Cast iron borings	31.00-32.00
Low phos.	*57.00-58.00*

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	*50.00-51.00*
No. 1 machinery	*54.00-55.00*

Railroad Scrap

Rails, random lengths	58.00-59.00
Rails, 3 ft and under	64.00-65.00
Railroad specialties	59.00-60.00

CINCINNATI

(Broker's buying prices; f.o.b. shipping point)

No. 1 heavy melting	53.00-54.00
No. 2 heavy melting	43.00-44.00
No. 1 bundles	53.00-54.00
No. 2 bundles	40.00-41.00
No. 1 busheling	53.00-54.00
Machine shop turnings	*32.00-33.00*
Mixed borings, turnings	33.50-34.50
Short shovel turnings	35.50-36.50
Cast iron borings	*32.00-33.00*
Low phos., 18 in.	*58.00-59.00*

Cast Iron Grades

No. 1 cupola	*49.00-50.00*
Heavy breakable cast	*47.00-48.00*
Charging box cast	*47.00-48.00*
Drop broken machinery	*58.00-59.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*62.00-63.00*
Rails, 18 in. and under	*70.00-71.00*
Rails, random lengths	*62.00-63.00*

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	45.00
No. 2 heavy melting	42.50
No. 1 bundles	45.00
No. 2 bundles	38.50
No. 1 busheling	45.00
Machine shop turnings	28.00
Short shovel turnings	29.50

Cast Iron Grades

No. 1 cupola	46.00
Charging box cast	45.00
Heavy breakable cast	43.00
Unstripped motor blocks	43.00
Brake shoes	45.00
Clean auto cast	49.00
Stove plate	43.00

Railroad Scrap

No. 1 R.R. heavy melt.	*57.50*
Rails, 18 in. and under	71.00
Rails, random lengths	*67.00*
Rails, rerolling	*72.50*
Angles, splice bars	62.00

SEATTLE

No. 1 heavy melting	39.00
No. 2 heavy melting	33.00-35.00
No. 1 bundles	35.00
No. 2 bundles	26.00
No. 3 bundles	17.00
Machine shop turnings	15.00-16.00
Mixed borings, turnings	15.00-16.00
Short shovel turnings	15.00-16.00
Electric furnace, bundles	52.00-55.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	*43.00*
Heavy breakable cast	*35.00*
No. 1 wheels	35.00
Unstripped motor blocks	30.00
Clean motor blocks	35.00
Stove plate (f.o.b. plant)	30.00
Brake shoes	30.00

Railroad Scrap

Rails, random lengths	38.00

LOS ANGELES

No. 1 heavy melting	38.00
No. 2 heavy melting	32.00
No. 1 bundles	37.00
No. 2 bundles	28.00
Machine shop turnings	17.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	42.00

SAN FRANCISCO

No. 1 heavy melting	36.00
No. 2 heavy melting	30.00
No. 1 bundles	35.00
No. 2 bundles	26.00
No. 1 busheling	36.00
Machine shop turnings	20.00-23.00
Mixed borings, turnings	20.00-23.00
Cast iron borings	20.00-23.00
Short shovel turnings	25.00
Cut structurals	45.00
Heavy turnings	20.00-23.00
Punchings & plate scrap	44.00

Cast Iron Grades

No. 1 cupola	45.00
Charging box cast	35.00
Stove plate	39.00
Heavy breakable cast	36.00
Unstripped motor blocks	32.00
Brake shoes	35.00
Clean auto cast	45.00
No. 1 wheels	39.00
Burnt cast	23.00
Drop broken machinery	50.00

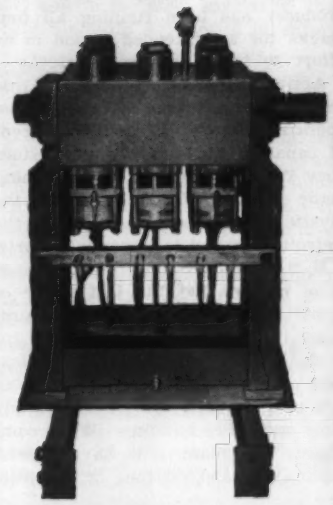
HAMILTON, ONT.

No. 1 heavy melting	50.50
No. 2 heavy melting	46.50
No. 1 bundles	50.50
No. 2 bundles	43.00
Mixed steel scrap	44.50
Mixed borings, turnings	24.00
Rails, remelting	58.50
Busheling, new factory: Prepared	48.50
Unprepared	44.50
Short steel turnings	27.50

Cast Iron Grades†

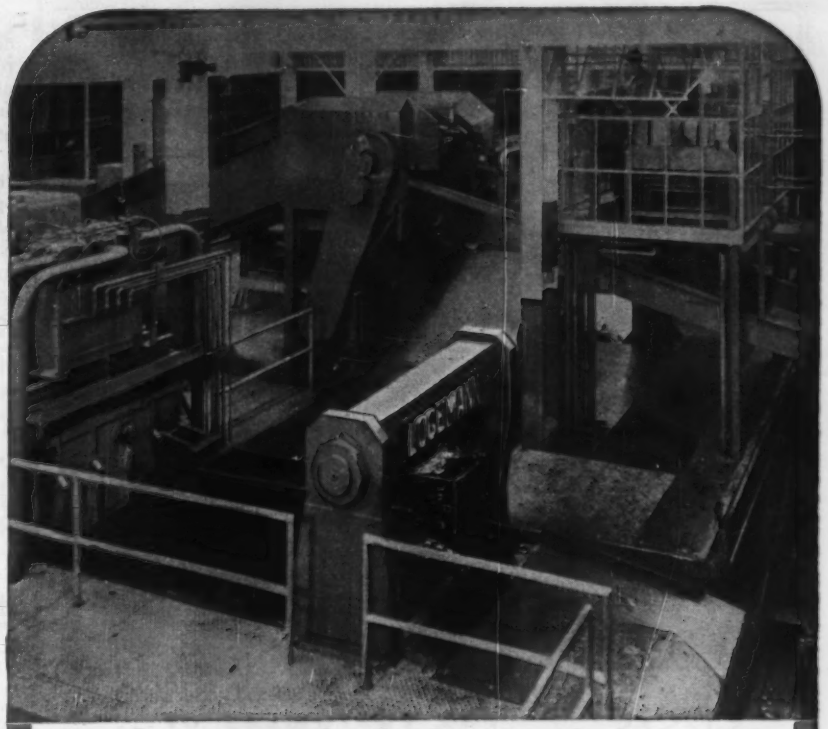
No. 1 machinery cast	50.00

†F.o.b., shipping point.



LOGEMANN HYDRAULIC OPERATING VALVE

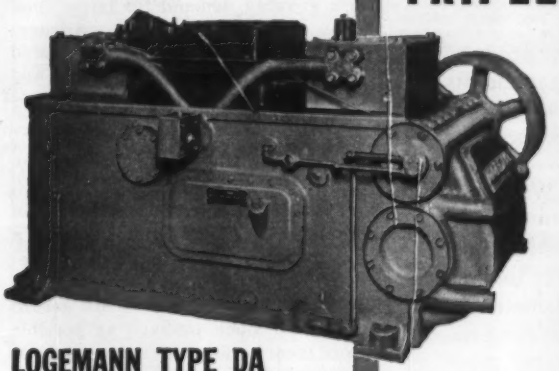
This compact valve was designed to control the movements of the hydraulic rams in large scrap presses but can be modified to suit similar operations on other hydraulic equipment. Interested parties will please outline the nature of the service, operating sequence, gallonage and pressure requirements.



Get low cost, high density bales with LOGEMANN SELF-CONTAINED TRIPLE-COMPRESSION PRESSES

The illustration shows one of two large scrap-press units in a modern automotive plant. Over a period of many years, such units have baled sheet scrap skeletons and trim from metal operations in large industrial plants throughout the country, forming the scrap into high-density bales for re-melting in steel mills. Low baling costs are the result of correct design for heavy duty service, minimum maintenance and operating interruptions, as well as simplicity, accessibility and safety features.

Pioneers in the metal baling field, LOGEMANN engineers embodied in the design those features that have proven dependable over an extended period of years. Some installations in service over 35 years are still operating economically.



LOGEMANN TYPE DA DOUBLE PRESSURE PUMPS

These compact and efficient opposed-cylinder reciprocating-plunger pumps for low and high pressure service lend themselves to a wide range of double pressure applications. They are close-coupled, reliable, and capable of delivering high gallonage, at low and high pressures, at low power costs.

Tell Us the nature of your scrap!

LOGEMANN press sizes are not confined to the large models. Producers of sheet scrap—steel, copper, brass, or aluminum—are invited to submit their scrap baling problems regardless of tonnage. Please state the character of the metal, minimum tonnage to be handled in a given period of hours, range of gauges and, where possible, indicate maximum and minimum lengths and widths of pieces. Experienced sales engineers are available for discussion of your conditions and requirements.

LOGEMANN BROTHERS CO.

3126 W. BURLEIGH STREET • MILWAUKEE 10, WISCONSIN

KEYSTONE XL COLD HEADING WIRE

COSTS REDUCED ON THESE COLD HEADED PARTS

FOR CUSTOMERS OF...

"ROCKFORD" Screw Products Co.

These fasteners are but a few of thousands that fill the needs of customers of Rockford Screw Products Co., cold heading specialists of Rockford, Illinois. Large or small, recessed, upset or solid heads —there's hardly a size or shape part this well-known producer has not successfully headed.

The *flowability* characteristics of Keystone "XL" Wire have played an important role in the development of extreme cold headed parts today. As a result, more and more users of fasteners have converted to the modern, cost-cutting cold heading method because of the great savings in production time and materials. Keystone metallurgists have kept pace with these increasing demands, constantly improving wire quality for better finished products, free from defects, with greater die life, longer runs — and lower costs. Perhaps modern, cold heading methods can reduce your fastener costs. Keystone does not "cold head," but supplies the quality wire to solve the toughest, most intricate forming problem.

FREE BOOKLET—"FACTS ABOUT COLD HEADING WIRE"

A new, technical booklet, containing many illustrations, may help you with your fastener problem. Write for your free copy. And, remember, Keystone makes quality wire for all kinds of industrial needs. Your inquiries are invited.

KEYSTONE STEEL & WIRE COMPANY, Peoria 7, Illinois

KEYSTONE WIRE *for Industry*

(*Concluded from page* 187)

down one of its four active blast furnaces for a relining job. This producer has been running all four stacks for an extended period in an effort to build up reserve stocks.

Active demand for merchant iron from Buffalo producers reflects an operating rate of 85 to 100 per cent of capacity by foundries in western New York. Shipments also are being made to New England (where the Mystic furnace is still down), to the Detroit area and to upper lake ports.

U. S. Pipe & Foundry Co., Birmingham, has started the last phase of a multi million dollar expansion program at North Birmingham. Included in the program, started last year, are a blast furnace with 1000-ton daily capacity, laboratory, supply store and office building. When completed, the plant will have annual capacity of 850,000 tons of pig iron.

Electrode Expansion Planned

National Carbon Co., division of Union Carbide & Carbon Corp., plans a multimillion dollar expansion program that will substantially increase production of carbon and graphite electrodes for the fourth time in five years.

Both the steel and chemical industries are using more electrodes. In addition, rapid development of nuclear energy applications has resulted in a growing demand for large, fine-grain graphite materials. Advancing industrial technologly has created specific needs for many carbon and graphite specialty products.

Warehouse . . .

Warehouse Prices, Page 175

Demand for warehouse steel is well sustained. Distributors report a gradual increase in inquiries for delivery in late second quarter. Numerous smaller consumers are forced to get as much tonnage as possible from them because of the heavily sold position of the mills.

Most warehouse officials look for second quarter business to be on a par with that of the busy first quarter.

Plates and shapes are in most critical supply. Large plate orders are received frequently from construction companies and heavy equipment builders which normally buy from mills. Warehouses fill as much of the overflow demand as possible, but some have been forced to turn down large orders owing to the shortage. There's no sign of an improvement in availability of plate or structural shapes.

Seasonal needs have stimulated

business in fence, fasteners and galvanized sheet. Distributors could sell more hot-rolled carbon bars and hot and cold-rolled sheets if they could maintain a rounded inventory.

Iron Ore . . .

Iron Ore Prices, Page 183

The Great Lakes ore shipping season is getting off to a fast start. Shipments of iron ore from the upper lakes in the week ended Apr. 16 were 1,313,831 gross tons, reports the Lake Superior Iron Ore Association. This compared with only 321,857 tons in the like week a year ago. The 1956 season movement to date is 1,378,170 tons, more than 1,046,000 above last year's mark at this time.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

10,000 tons, power plant, Memphis Light, Gas & Water Commission, Memphis, Tenn., to Allied Structural Steel Co., Chicago.

7000 tons, transmission towers, American Gas & Electric Services Corp., Macksburg, O., to an Italian fabricator.

7000 tons, office building, Broad St., New York, through Fisher Bros., to Bethlehem Steel Co., Bethlehem, Pa.

2640 tons, 11 grade separations, Connecticut turnpike project 312-01, Bridgeport-Stratford, to Bethlehem Steel Co., Bethlehem, Pa.; L. G. DeFalice & Son Inc., North Haven, Conn., general contractor.

2000 tons, plant at Anaheim, Calif., for the Standard Pressed Steel Co., Jenkintown, Pa.; bids Apr. 27.

400 tons, state sanatorium, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.

350 tons, addition, Steel Strapping Division, Stanley Works, New Britain, Conn., to Berlin Construction Co., Berlin, Conn.

200 tons, office building, Alan Wood Steel Co., Ivy Rock, Pa., to Easton Steel Structures, Easton, Pa.

195 tons, warehouse, Krause Foods Co., Peach Glen, Pa., to Dauphin Steel & Engineering Co., Harrisburg, Pa.

180 tons, freight buildings, Delaware, Lackawanna & Western, Buffalo, to Central Steel Construction Corp., Buffalo.

150 tons, two freight houses, Elizabeth, N. J., through D. O. Evans, to Bethlehem Steel Co., Bethlehem, Pa.

70 tons, addition, Olympia Brewing Co., Olympia, Wash., to Pacific Car & Foundry Co., Seattle; A. G. Homann Co., Olympia, general contractor.

STRUCTURAL STEEL PENDING

7700 tons, trestle, Calumet skyway toll bridge project, Chicago, Bethlehem Steel Co., Bethlehem, Pa., low; bids Apr. 3.

4300 tons, Morrison and Hawthorne bridge approaches, Portland, Oreg.; Kuckenberg Construction Co., Portland, low at $4,789,981 to Multnomah county commissioners.

3225 tons, carbon and silicon deck trusses, plate girder floor beams and rolled beam stringers, Calumet skyway project, Chicago; Mt. Vernon Bridge Co., Mt. Vernon, O., low; bids Apr. 6.

2000 tons, bridge superstructure, Portland, Oreg.; bids to Multnomah county commissioners, May 1; also open steel grating deck.

1450 tons, reconstruction, Squire's bridge and approaches, Somerville, Mass.; bids Apr. 26, Metropolitan District Commission, Boston; also 650 tons, reinforcing bars, and 43,000 sq ft steel grid deck.

1300 tons, diffuser and scoop, supersonic circuit, propulsion wind tunnel; bids May 22, Corps of Engineers, Tullahoma, Tenn.

1300 tons, terminal, United Air Lines, Idlewild Airport, Long Island, N. Y., bids in.

800 tons, section 26-2, Brooklyn-Queens expressway, New York, bids closed.

600 tons, section 56-1, Brooklyn-Queens expressway, New York, Horn Construction Co., low on general contract.

MANUFACTURERS REPRESENTATIVES WANTED

in New York, Chicago, Philadelphia, Cleveland, Michigan, Wisconsin, New Jersey, and in several midwestern and southern outstate areas having considerable industrial activity by a very progressive high volume manufacturer of stamped lockwashers and special stamped fasteners. A 10% commission line. Box No. 404, STEEL, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Must modern and progressive steel foundry in the middle west. Advise full particulars.

Swedish Crucible Steel Co.
8561 Butler Avenue
Detroit 11, Michigan

TUBE MILL
Supervisor

A considerable amount of recent cold-forming mill experience required. Applicant must be able to completely manage a steel pipe manufacturing department. Must be able to train and instruct necessary operators in modern techniques of automatic welding, etc. Technical knowledge essential. Supervisor will be required to recognize and correct technical difficulties. This position will offer growth and progress with one of California's largest steel fabricating manufacturers. Send complete confidential resume and salary requirements with personal photograph if available to Box 410, STEEL, Penton Bldg., Cleveland 13, Ohio.

WANTED
BY REPUTABLE MANUFACTURER

A man experienced in the manufacture of Machine Screws—Must be expert Header Mechanic and assume complete charge. Can purchase stock in company. Please supply full information and expected remuneration.

Reply Box 409, STEEL
Penton Bldg. Cleveland 13, Ohio

WANTED BY LARGE REPUTABLE MANUFACTURER

A man experienced in the manufacture of seamless welding fittings to assume complete charge of this departmental activity to develop and expand it. In replying, please supply full information on experience and expected remuneration.

Reply Box 400, STEEL
Penton Bldg. Cleveland 13, Ohio

CLASSIFIED

Help Wanted

MECHANICAL ENGINEER—Recent M.E. graduate desired for employment as project engineer in long established valve manufacturing firm. Permanent position. Excellent opportunity for advancement. Salary commensurate with ability. Located in progressive North Central Penna. community. Experience in Pressure vessels and piping desirable but not necessary. Submit qualifications to Box 403, STEEL, Penton Bldg., Cleveland 13, Ohio.

DESIGNER FOR FORMING ROLLS used in producing hollow metal sections on cold metal roll forming machines. Capable of handling roll design and supervising production and testing of rolls. Old established company; submit complete qualifications and salary desired. Box No. 407, STEEL, Penton Bldg., Cleveland 13, Ohio.

Accounts Wanted

STEEL ERECTOR with design and detailing facilities wishes to represent structural steel fabricator in metropolitan N. J. Write Box 408, STEEL, Penton Bldg., Cleveland 13, Ohio.

100 tons or more, Alaska Road Commission projects; bids to General Services Administration, Seattle, Apr. 23.

100 tons, 156-ft Denali highway bridge, Alaska; Williams Equipment Co., Fairbanks, Alaska, low to Alaska Road Commission.

REINFORCING BARS . . .

REINFORCING BARS PLACED

975 tons, four grade separations and two ramp structures, Connecticut turnpike project 311-03, Bridgeport, to Taylor-Davis Co., Philadelphia; Frouge Construction Co., Bridgeport, general contractor; 1115 tons, steel piles, to Bethlehem Steel Co., Bethlehem, Pa.

350 tons, Weyerhaeuser Timber Co., office building addition, Tacoma, Wash., to J. D. English Steel Co., Tacoma; MacDonald Building Co., general contractor.

200 tons, small tonnages, local construction projects, to Bethlehem Pacific Coast Steel Corp., Seattle.

REINFORCING BARS PENDING

500 tons, Shadle Park High School, Spokane, Wash.; Henry George & Sons, Spokane, low at $1,837,613.

400 tons, office, Chrysler Corp., Philadelphia; bids asked.

100 tons, two slab bridges, Washington state highway project; bids to Olympia, Wash., May 1.

100 tons, Morrison bridge; bids to county commissioners, Portland, Oreg., May 1.

65 tons, Washington state bridge, Pacific county; N. Fiorito Co., Seattle, is low bidder at $424,818.

Unstated, Oregon state highway projects: Clackamas county, 343-ft bridge; Columbia county, 120-ft girder span; Tillamook and Washington counties, 168-ft and 152-ft bridges; bids to Portland, Oreg., Apr. 26, Clatsop county, piers and 374-ft superstructure; Multnomah county, 160-ft expressway viaduct, bids to Portland, Apr. 27.

PLATES . . .

PLATES PLACED

200 tons, 16 storage tanks for Olympia Brewing Co., Olympia, Wash., to Puget Sound Fabricators, Seattle.

PLATES PENDING

250 tons, ¼-in., Letterkenny Ordnance Depot, Chambersburg, Pa.

100 tons, water storage tanks; bids to Milton-Freewater, Oreg., Apr. 16.

PIPE . . .

CAST IRON PIPE PLACED

144 tons, Seaside, Oreg., and 83 tons, Puyallup, Wash., to Pacific States Cast Iron Pipe Co., Portland, Oreg.

60 tons, 1500 ft of 12 in. supply pipe, Montesano, Wash., to unstated interest.

RAILS, CARS . . .

LOCOMOTIVES PLACED

New York Central, thirty 1750-hp electric road switchers to Electro-Motive Division, General Motors Corp., La Grange, Ill.

RAILROAD CARS PENDING

New York Central inquiring for 2000 tons of car wheels.

SAVE!

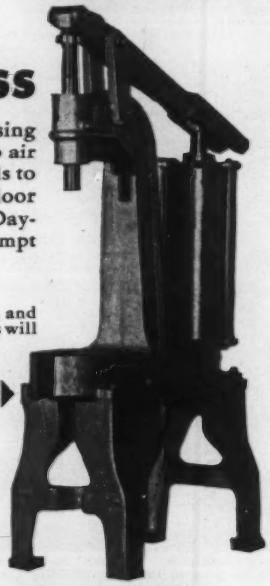
WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.

WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $519.

1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $232.



Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 523 S. WOLF ROAD, DES PLAINES, ILLINOIS

Any Way You Figure It...

STERLINGS COST LESS PER YEAR

You want to reduce your material transport costs? You can do it easily with Sterling Wheelbarrows. They are engineered and built for the tough jobs. All steel . . . all welded . . . no rivets . . . barrows so ruggedly constructed, they seem to last forever. The unusually long service life of Sterling Wheelbarrows protects your initial investment. And maintenance costs are almost nil. Compared to other barrows, Sterlings actually cost less per year. Get the facts. Write for catalog.

•

IMMEDIATE SHIPMENT

•

DEALERS: Ask about our liberal dealer selling plan.

Costs Less per Year

Look for this Mark of STERLING Quality

STERLING WHEELBARROW CO., Milwaukee 14, Wis.

Sterling WHEELBARROWS

A 7637-½

Advertising Index

Acme Chain Corporation 5
American Brake Shoe Co., Electro-Alloys Division 97
American Gas Association 38
American Gear & Mfg. Co. 154
American Smelting & Refining Co., Federated Metals Division 98
American Steel & Wire Division, United States Steel Corporation 34
American Zinc, Lead & Smelting Co. 167
American Zinc Sales Co. 167
Armstrong-Blum Mfg. Co. 61

Baldwin-Lima-Hamilton Corporation, Loewy-Hydropress Division 51
Barber-Colman Co., Hendey Machine Division 102, 103
Barium Steel Corporation 165
Barry Controls, Inc. 169
Bay City Forge Co. 182
Beryllium Corporation, The 176
Bethlehem Steel Co. 1
Bliss, E. W., Co., Mackintosh-Hemphill Division 131
Brownir Victor R., & Co., Inc. 182
Buffa[illegible]rge Co. 32
By-Pr[illegible]ucts Steel Co., A Division of Lukens Steel Co. 76

Carpenter Steel Co., The 52
Chase Brass & Copper Co. 135
Chicago Steel Service Co. 128
Cincinnati Milling Machine Co., The, Cincinnati Milling Products Division 13
Cincinnati Milling Machine Co., The, Process Machinery Division 73
Cleveland Crane & Engineering Co., The 146
Cleveland Hotel 16
Climax Molybdenum Co. 33
Colorado Fuel & Iron Corporation, The 55
Columbia-Geneva Steel Division, United States Steel Corporation 34
Continental Steel Corporation 152
Copper & Brass Research Association 11
Cross Co., The 89
Crucible Steel Company of America 141

Dempster Brothers 130, 131
Diamond Mfg. Co. 184

Eastern Machine Screw Corporation, The 182
Electric Controller & Mfg. Co., The 14, 15
Electric Steel Foundry Co. 147
Electro-Alloys Division, American Brake Shoe Co. 97
Enterprise Galvanizing Co. 182
Eureka Fire Brick Works 187
Exide Industrial Division, The Electric Storage Battery Co. 57

Federal Bearings Co., Inc., The 56
Federal Products Corporation 24
Federated Metals Division of American Smelting & Refining Co. 98
Fischer Special Mfg. Co. 178
Follansbee Steel Corporation 162
Foster, L. B., Co. 187

General Electric Co. 48, 49
Globe Steel Abrasive Co., The 149
Goodrich, B. F., Co., The, Industrial Products Division 7
Gould-National Batteries, Inc. 4
Great Lakes Steel Corporation 78

Hannifin Corporation 192
Harnischfeger Corporation, Welding Division .. 47
Heald Machine Co., The ..... Inside Front Cover
Hendey Machine Division, Barber-Colman Co. 102, 103
Hevi Duty Electric Co. 160
Homer Manufacturing Co., Inc., The 140
Horsburgh & Scott Co., The 142

Industrial Brownhoist Corporation 54
Inland Steel Co. 64
International Nickel Co., Inc., The 62

Jeffrey Manufacturing Co., The 35
Jessop Steel Co. 145
Johnson Bronze Co. 158
Jones & Laughlin Steel Corporation 86
Jones & Laughlin Steel Warehouse Division, Jones & Laughlin Steel Corporation 8, 9

Kaiser Aluminum & Chemical Sales, Inc., Kaiser Chemicals Division 36, 37
Kearney & Trecker Corporation 91
Keystone Steel & Wire Co. 190
Kidde, Walter, & Co., Inc. 10
Kinney Mfg. Division, The New York Air Brake Co. 39

Laclede-Christy Division, H. K. Porter Company, Inc. 157
Lamson & Sessions Co., The 161
La Salle Steel Co. 2
Lavallee & Ide, Inc. 85
Lindberg Engineering Co. 44
Link-Belt Co. 19
Loewy-Hydropress Division, Baldwin-Lima-Hamilton Corporation 51
Logemann Brothers Co. 189
Lukens Steel Co. 194
Lukens Steel Co., By-Products Steel Co. Division 76
Luria Brothers & Co., Inc. 186

McGill Manufacturing Co., Inc. 100
McKee, Arthur G., & Co. 127

Mackintosh-Hemphill Division of E. W. Bliss Co. 151
Manning, Maxwell & Moore, Inc. 150
Master Electric Co., The 99
Mesta Machine Co. 125
Metal & Thermit Corporation (Unichrome) 45
Miller Electric Manufacturing Co., Inc. 182
Minnesota Mining & Manufacturing Co. 143
Motch & Merryweather Machinery Co., The, Machinery Manufacturing Division 74

National Acme Co., The 153
National Roll & Foundry Co., The 155
National Steel Corporation 78
New Jersey Zinc Co., The 81
New York Air Brake Co., The, Kinney Mfg. Division 39
Nilson, A. H., Machine Co. 104
Norton Co., Machine Division 40, 41

Osborn Manufacturing Co., The 3
Ottawa Steel Products, Inc. 148

Pangborn Corporation 53
Peerless Electric Co., The 21
Pollock, William B., Co., The 92
Poole Foundry & Machine Co. 184
Pope Machinery Corporation 181
Porter, H. K., Company, Inc., Laclede-Christy Division 157
Pratt & Whitney Co., Inc. 159

Ransburg Electro-Coating Corporation 138
Reliance Electric & Engineering Co. 46
Remington Rand Division of Sperry Rand Corporation 113
Republic Steel Corporation 94, 95
Revere Copper & Brass, Inc. 123
Rockford Machine Tool Co. 28, 29
Ross Heat Exchanger Division of American-Standard 179
Russell, Burdsall & Ward Bolt & Nut Co. 82
Ryerson, Joseph T., & Son, Inc. 58

Scaky Bros., Inc. 22, 23
Service Steel 184
Sewall, E. B., Manufacturing Co. 25
Sharon Steel Corporation 27
Signode Steel Strapping Co. 96
Simonds Saw & Steel Co. 42, 43
Sperry Products, Inc. 114
Sperry Rand Corporation, Remington Rand Division 113
Sterling Wheelbarrow Co. 192
Stevens, Frederic B., Inc. 156
Stuart, D. A., Oil Co., Ltd. 26
Sun Oil Co., Industrial Products Department 17, 18
Swedish Crucible Steel Co. 191

Tennessee Coal & Iron Division, United States Steel Corporation 34
Thomas Flexible Coupling Co. 144
Timken Roller Bearing Co., The .... Back Cover
Townsend Co. 137
Twin Disc Clutch Co. 12

United States Rubber Co., Mechanical Goods Division 136
United States Steel Corporation, Subsidiaries 34, 50
United States Steel Export Co. 34
United States Steel Supply Division, United States Steel Corporation 50
Upson-Walton Co., The 193

Wallingford Steel Co., The 101
Walsh Refractories Corporation 6
Ward Steel Co. 16
Wheelabrator Corporation 30, 31
Wheland Co., The, Foundry Division 20
Wickwire Spencer Steel Division of The Colorado Fuel & Iron Corporation 55
Wilson, Lee, Engineering Co., Inc. ..... Inside Back Cover

~ ~ ~

Table of Contents, Page 5

Classified Advertising, Page 191

UPSON-WALTON
wire rope

You select
the wire rope best suited to your job from Upson-Walton's wide range of sizes and constructions ...factory-assembled slings also available.

You order
from nearby U-W distributors, who offer fast service from local stocks.

You get
long service from U-W wire rope ...it's a feature built in by U-W craftsmanship and high quality standards.

THE UPSON-WALTON COMPANY
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New York • Chicago • Pittsburgh
MANUFACTURERS OF
WIRE ROPE, ROPE FITTINGS, TACKLE BLOCKS
ESTABLISHED 1871

WOULD A TOUGHER STEEL CHANGE YOUR PLANS?

New Lukens "T-1" steel has three times the yield strength of carbon steel—cuts equipment weight, cuts costs!

■ Here's a new alloy steel with unusual resistance to abrasion, impact and atmospheric corrosion. It's tough—and *stays* tough at temperature extremes. These qualities help you sell...give your equipment longer life, better all-around performance.

If you build bridges, ships, construction machinery or any general industrial equipment, you can build your plans around Lukens "T-1" steel's outstanding fabrication qualities.

The latest addition to a complete line of carbon, alloy and clad steels, this all-purpose material is obtainable from Lukens in the widest range of plate sizes available anywhere! Whether you want specific product information or the best ways to make the most of it, write to Manager, Marketing Service, 846 Lukens Building, Lukens Steel Company, Coatesville, Pennsylvania.

Whatever your plans—now's the time to change to . . .

LUKENS "T-1" STEEL

LUKENS

THE NEWEST IN A COMPLETE LINE OF ALLOY STEELS
LUKENS STEEL COMPANY, COATESVILLE, PENNSYLVANIA

SECOND IN THE SERIES

Customer's Report

"Lee Wilson 'O' Tube Heat Application Assures Quality Annealing"

Only in the Lee Wilson single stack furnace is the heat applied uniformly around the circumference of the charge and properly distributed in the vertical direction. Such heat application results in the most effective use of the heat available. As one customer recently stated — "I am convinced that the Wilson 'O' tube heat application assures quality annealing."

It is this type of heat application in the Wilson single stack furnace with a temperature control for every stack of steel that enables the operators to maintain exacting control of the temperature throughout the entire annealing period.

Only Lee Wilson Furnaces Give You All These Advantages

1. GREATER FLEXIBILITY
2. MORE UNIFORM HEAT APPLICATION
3. IMPROVED CUSTOMER SERVICE
4. HIGHER PRODUCTION
5. BETTER LOAD FACTOR
6. MINIMUM PROCESS INVENTORY
7. REDUCED LABOR COST
8. BETTER OPERATING CONDITIONS
9. LOWER MAINTENANCE COST
10. REDUCED INSTALLATION COSTS

Lee Wilson* **ENGINEERING COMPANY, INC.**

20005 WEST LAKE ROAD • CLEVELAND 16, OHIO

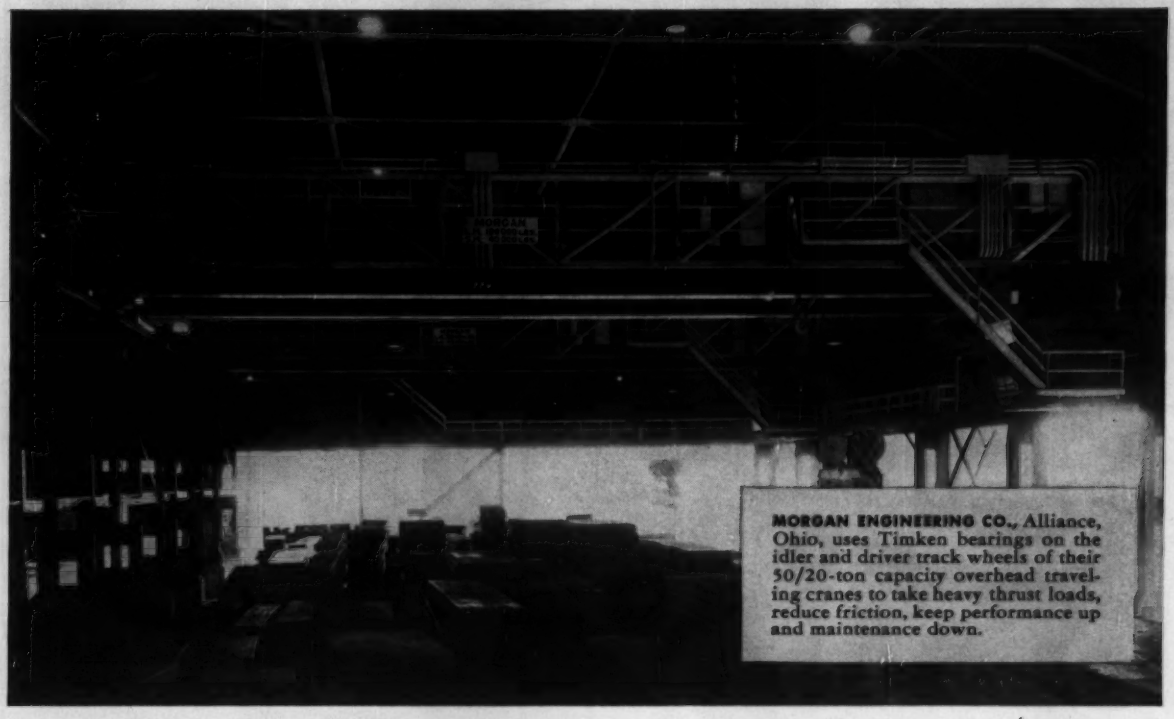
SINGLE-STACK RADIANT TUBE ANNEALING FURNACES

MAKE THE BEST METALS BETTER

* ORIGINATORS AND LEADING PRODUCERS OF SINGLE-STACK RADIANT TUBE FURNACES

9919

The trend is to single stack, one of the nation's largest annealing departments recently set into operation 24 Lee Wilson Single Stack Furnaces and 72 bases.



MORGAN ENGINEERING CO., Alliance, Ohio, uses Timken bearings on the idler and driver track wheels of their 50/20-ton capacity overhead traveling cranes to take heavy thrust loads, reduce friction, keep performance up and maintenance down.

Morgan Cranes move hot slabs fast

...TIMKEN® bearings cut traveling costs

THESE Morgan heavy-duty cranes move hot steel slabs from cars to storage in an Eastern steel mill and do it fast. To be sure they keep rolling and at minimum cost, Morgan engineers mounted the idler and driver track wheels on Timken® tapered roller bearings. They keep them on the go with minimum maintenance.

The tapered construction of Timken bearings lets them take *both* radial and thrust loads in any combination. And full line contact between the rollers and races gives Timken bearings *extra* load-carrying capacity. They can take the heavy thrust loads of crane operation in stride. No additional thrust devices are needed. Longer bearing life is assured. Cranes keep rolling.

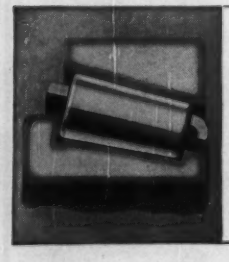
Timken bearings practically eliminate friction because they are designed by geometrical law to have true rolling motion and are made microscopically accurate to conform to their design. Because friction is reduced wheels and loads roll smoothly. Costly maintenance drops, power is saved.

And by holding housings and shafts concentric, Timken bearings make closures more effective. Dirt and dust stay out; lubricant stays in. Lubricant and upkeep costs are also decreased.

What's more, to be sure of toughest, finest bearing steel, we make our own. We're America's only bearing manufacturer that does.

Only Timken bearings give you so many advantages. Always specify Timken bearings for the machines you buy or build. Be sure the trademark "Timken" is on every bearing —it's your assurance of full, money-saving value. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◐ AND THRUST ⊣◐⊢ LOADS OR ANY COMBINATION ✳